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European Ore Carrying Steamship

THE steamship Vollrath Tham, lately constructed by R. & W. Hawthorn, Leslie & Co., of Hebburn-on-Tyne, to the order of the Rederiaktiebolaget Lulea-Ofoten, has had incorporated in its design many novel features and ranks as one of the most interesting types of vessels now being used for iron ore transport.

The vessel, which is seen in Fig. 1, has been built to the British Corporation highest class, has a length over all of 390 ft., a length between perpendiculars, over stem and stern post, of 376 ft., a breadth of 56 ft. 6 in., a depth of 33 ft. 6 in., and a deadweight capacity of 8,000 tons. She has been fitted by the North-eastern Marine Engineering Co., with triple-expansion engines, and steam is supplied by three cylindrical boilers, working at a pressure of 180 lb. There are two ballast pumps, capable of handling 600 tons per hour. On her trials, the Vollrath Tham attained a speed of over 10 knots, and on the occasion of her maiden voyage, in ballast, from the Tyne to Narvik, the average speed exceeded 10½ knots per hour, whilst the speed, loaded, has since averaged 9½ knots. The vessel has been specially designed to carry iron ore with a view to quick and economical loading and discharging, and, in substitution of the ordinary holds, she has been divided into a series of hoppers and discharging holds, as will be gathered by a reference to the line engravings, Figs. 2 and 3.

Before the construction of the vessel was commenced, a series of prolonged experiments were carried out at the Hebburn shipyard with a quantity of the actual ore in order to ascertain the most efficient mechanical device for operating the doors, the correct angle of slope for the various ridges and the proper size for the chutes having previously been

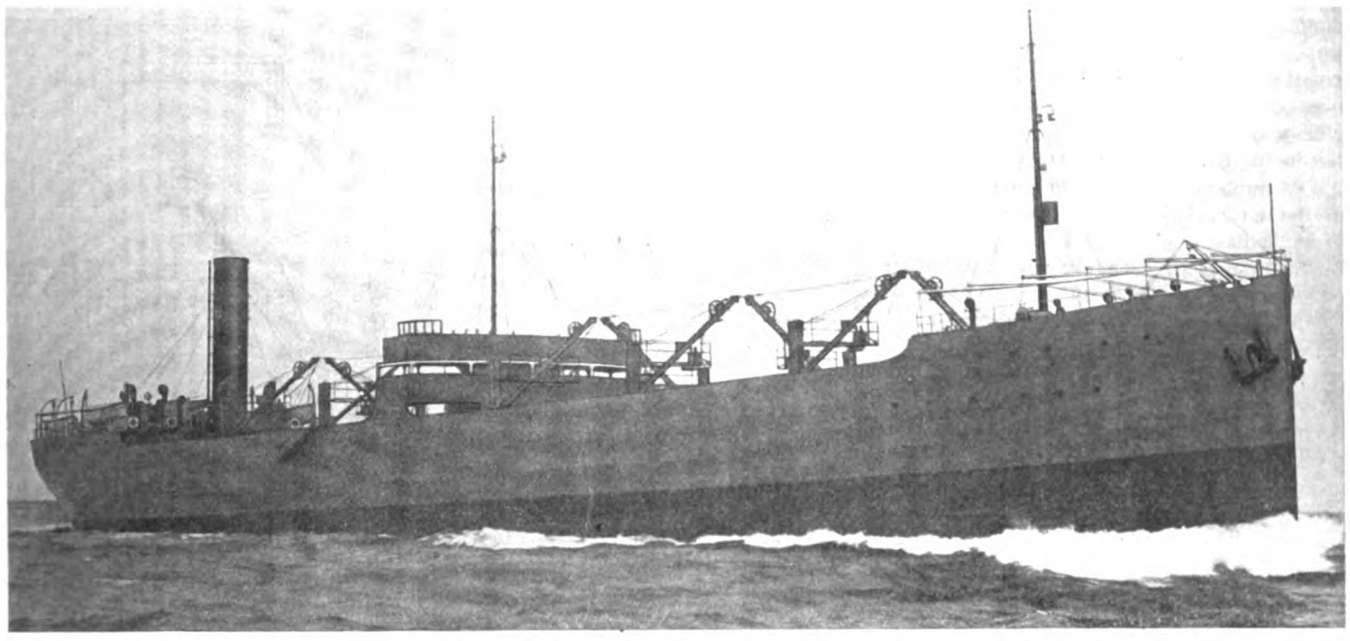


FIG. 1—THE ORE CARRYING STEAMER VOLLRATH THAM.

obtained from experiments carried out in one of the ordinary vessels of the Rederiaktiebolaget Lulea-Ofoten.

As a result, the hoppers are raised some distance from the tank top, and they have been constructed in a substantial manner with bases sloping 42 degrees to the horizontal, and the ore travels to a series of four chutes, each of which is manipulated from the discharging holds. The door of each of these chutes is fitted with a lever, about 7 ft. in length, and the door moves with a parallel motion eccentrically, thus relieving the pressure of the ore on the door, and permitting the door to be easily opened by one man. Upon the skip attached to the crane rope being lowered into position, the attendant is enabled, by operating the door lever, to arrange for the requisite amount of ore to travel into it. Thereupon the door having been dropped, the bucket is drawn to the top, the craneman having had the whole of the operations under his observation. The arrangement of chute doors may be seen in Fig. 4. The hatchways, 2 ft. 6 in. high above deck level, are formed of continuous longitudinal girders divided by athwart ship plates, and they were designed to suit the loading arrangements at Narvik, where the dock spouts are placed at intervals of about 13 ft. These hatchways being of somewhat unusual dimensions, special provision was made for securing the covers by means of a number of wooden beams, as shown in Fig. 5. Having been specially designed for the ore trade, the Vollrath Tham must necessarily go one way in light trim, and has, therefore, in addition to the double bottom, been fitted with wing tanks, similar to those commonly used on the Great Lakes, giving her a total water ballast capacity of about 3,000 tons. As these wing tanks are required to support a considerable part of the ore, they have been built of very substantial scantlings and divided at intervals of about 12 ft. by complete or partial bulkheads. To maintain watertightness against falling ore, the tanks have been sheathed with 5½-in. pine covered with ⅜-in. steel plate in way of the hoppers, and, as the tanks are continuous, they add considerable longitudinal strength—a matter of considerable importance in an ore vessel owing to the irregular distribution of the loads. The generating plant and switchboard for power and lighting and operating the cranes are fitted in a separate machinery room at the after end of the vessel immediately aft of the main engines. There are two duplicate generating sets, each consisting of a compound enclosed type engine with forced lubrication, running at 400 R. P. M., and coupled direct to a Siemens compound

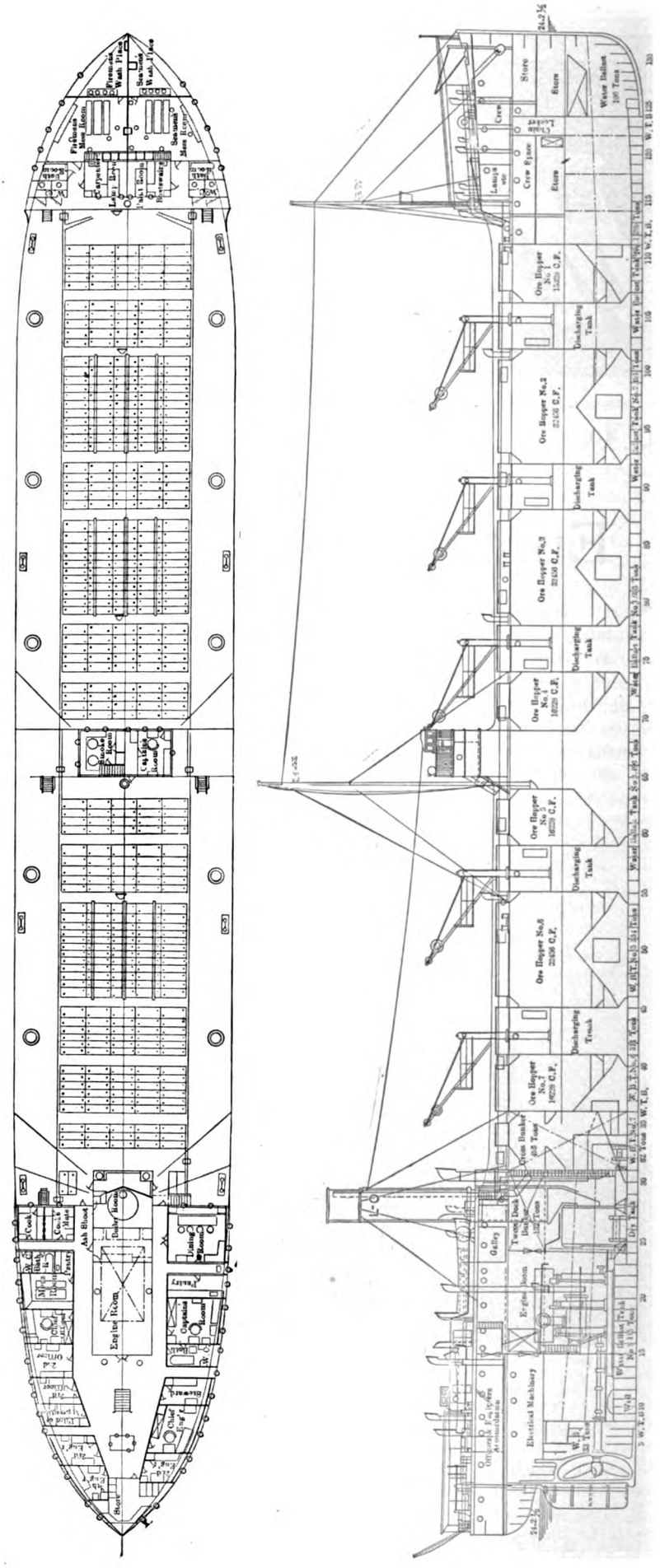


FIG. 2—INBOARD PROFILE AND DECK PLANS OF ORE CARRYING STEAMER VOLLRATH THAM.

wound generator, capable of developing 75 kilowatt at 220 volts. The electric lighting set has a capacity of 64.5 amperes at 110 volts. There are ten electric cranes, five on each side of the vessel, and each of these has a lifting capacity of 2½ tons, with a speed of 75 ft. per minute. The cranes are of a special type, having their mechanism all below deck level, as seen in Fig. 3, and the post is fitted with gland end stuffing box, so that the crane room is continuously watertight. On the side of the jib is fitted the operating platform, which is so arranged that the craneman is able to see all the movements of the skip when loading and emptying the same. The two controllers are together and they are fitted with one lever which is so arranged that the load follows the direction of the move-

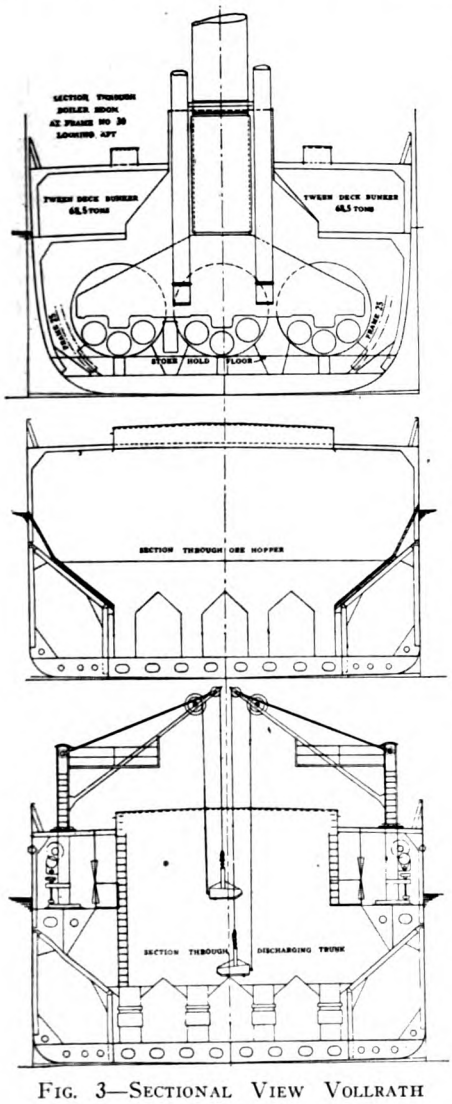


FIG. 3—SECTIONAL VIEW VOLLRATH THAM.

ment of the lever. The platform and arrangement of controllers are clearly seen in Fig. 5. By the operation of a lever, which is within easy reach of the crane platform, the skip, which has a carrying capacity of about 2 tons of ore,

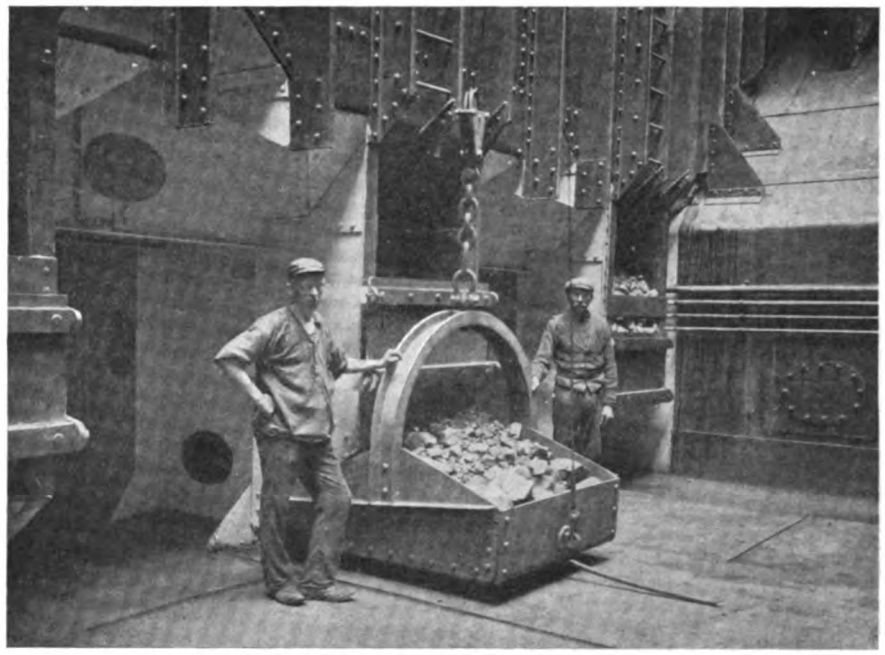


FIG. 4—DISCHARGE CHUTE AND ORE SKIP IN ONE OF THE DISCHARGE COMPARTMENTS.

may be tipped in any position. Fig. 6 gives a view of three of the cranes on one side of the vessel and of the ore being tipped from two of the skips into lighters at Emden. These cranes have a capacity of 40 to 50 tons per hour each. On the occasion of the first voyage of the Vollrath Tham, it is said that her cargo of 8,200 tons was discharged in 47 working hours by a staff of 15 men from the ship's crew, and with only five of the cranes working, the consumption of coal meanwhile being 10 tons. In the design of the Vollrath Tham regard was paid not so much to securing a reduction in the terminal time as in the reduction in the cost of labor in discharging, and, with a vessel of similar capacity, but built on the ordinary principle, it is claimed that 120 men would have to be engaged 40 hours, and that the coal consumption would amount to about 30 tons. As the mines from which this Swedish ore is obtained are situated within the Arctic circle, and the ore is sent down to Narvik in a wet state, there is provided under each of the ore pockets in the Vollrath Tham, a special boiler and system of steam pipes for use in the winter season. The equipment of the vessel is very complete and includes Welin's davits, together with Engelhardt's collapsible life boat, and telemotor steering

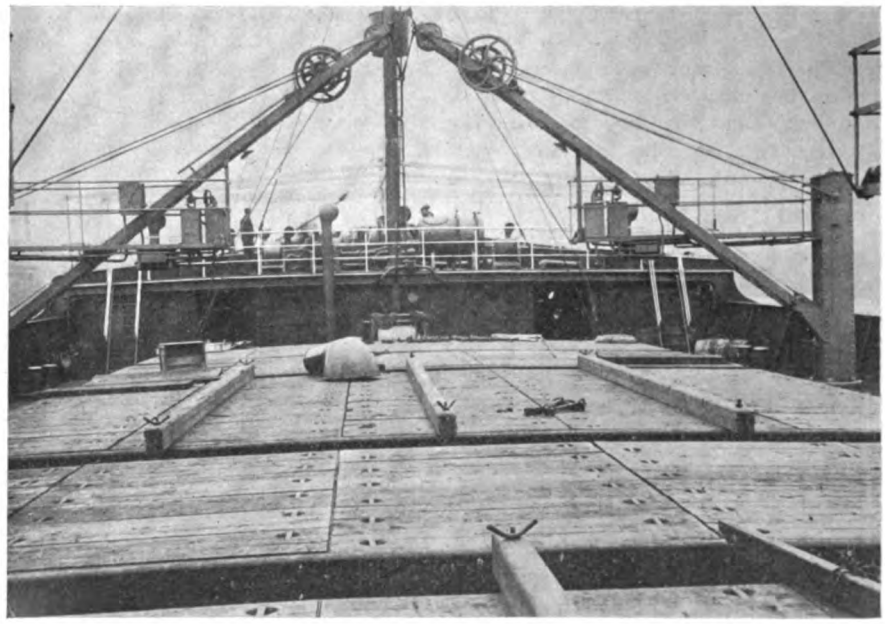


FIG. 5—VOLLRATH THAM LOOKING FORWARD.

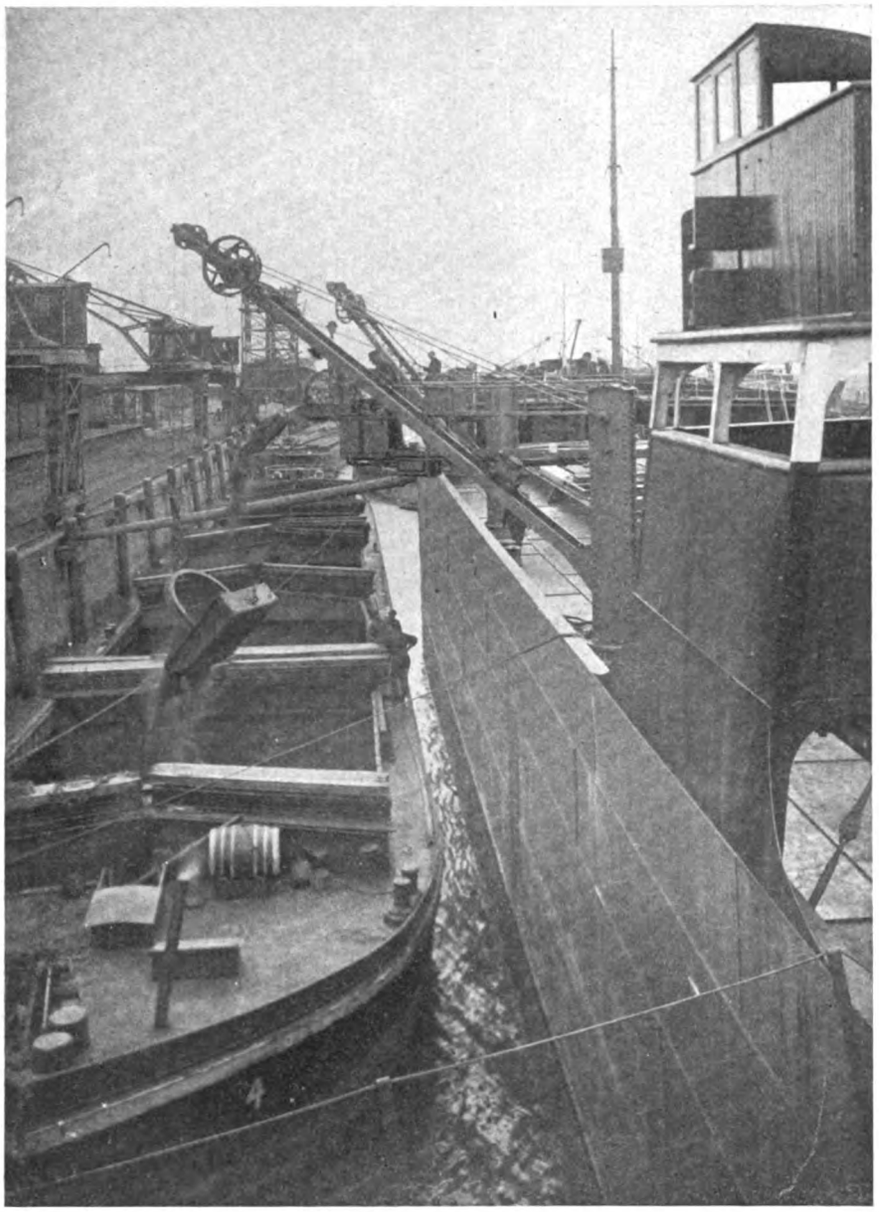


FIG. 6—VOLLRATH THAM. CRANES DISCHARGING ORE INTO LIGHTERS.

gear. The captain and officers have commodious quarters at the after end of the ship, and amidships there is also a captain's room, while the crew are berthed forward.

The Rederiaktiebolaget Lulea-Ofoten is a transport company subsidiary to the Trafik Aktiebolaget Grangesberg-Oxelösund, of Stockholm, who, as one of the largest mining syndicates in northern Europe, work the extensive iron ore mines at Gellivare and Kirunavaara, in Lapland, which together produce more than one-half of the total amount of ore obtained in Sweden. By means of the Ofoten-Lulea state railway, which runs alongside Lake Tornea and is the most northerly railway line in the world, these mines have connections with the shipping ports of Lulea (Sweden) and Narvik (Norway). Narvik is a comparatively new port, and although at lat. 68.26N it is free from ice all the year round. The Trafik Aktiebolaget Grangesberg-Oxelösund, of Stockholm, who annually ship from Narvik some 2,500,000 tons of ore, possess at this place large storage grounds fitted with the most approved appliances for the economical and expeditious handling of large consignments of ore, and Fig. 7 is a view of the ore loading dock, which is capable of dealing with about 1,000 tons of ore per hour, and alongside which there is a least depth of 27 ft. at any stage of tide.

The ship was built to the designs and under the patents of Johnson & Welin, naval architects, Gothenburg and Stockholm. Another vessel of similar type, but to carry 11,000 tons of ore, is now under construction by the same builders and for the same owners.

In comparing the Vollrath Tham with the ore carriers of the Great Lakes, it must be borne in mind that the conditions in the one case are entirely different from those of the other. On the Great Lakes the ore trade is enormous in volume and the constant effort is to improve the ship as a carrier only and to treat the unloading equipment as an entirely distinct subject. The points of discharge are clearly defined and the unloading apparatus is fixed ashore and the traffic so regulated as to keep all equipment as fully employed as possible. The ship, therefore, is not hampered either in cost or deadweight with any cargo handling apparatus whatever, and on the other hand, the constant employment warrants the investment in shore plant and betterments which have made the existing cargo records and costs possible.

The Swedish ore is hard and relatively low in moisture and trims freely to and through a spout, while by far the

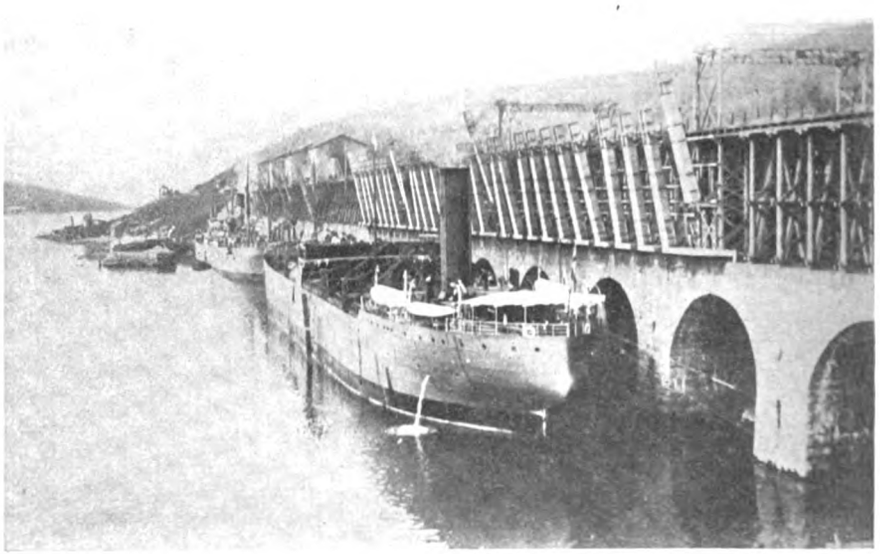


FIG. 7—THE VOLLRATH THAM ALONGSIDE THE ORE LOADING BERTHS AT NARVIK.

larger proportion of the Lake Superior ores will not; in fact, it is common to see an almost, if not quite, vertical face of several feet in height produced by the unloading machines. These qualities also facilitate the use of the grab bucket unloader in the case of the American ores and operate against it in Swedish ores. At the same time, the output of less than 12 tons per hour per man is extremely low and the port time of the ship compared with the length of voyage is correspondingly high.

The Sieurin Ore Discharging Gear

FOR discharging iron ore, recent experiments on board the specially designed ore carrier, the S. S. Paulina, has demonstrated that for quck dispatch and economy, the Sieurin discharging gear, which is equivalent to some hundreds of men, and yet when bulk cargoes have to be dealt with, scores of men are frequently employed in shoveling the same. Clearly the proper course is to utilize the power of the winches, not only to lift the cargo, but also to pitch it out from the remote parts of the ship's hold, and thus do away with the heavy expense of shoveling it. The Sieurin gear has been designed with this object in view. It enables the cargo to be discharged by men driving the ship's winches, thereby saving the great number of men usually employed in the hold. Even stanchions, engines amidship and shaft tunnels in the holds are not obstacles to the effective working of the Sieurin gear. The scoop is just as capable of filling itself around the stanchions, and in the afterholds of steamers with engines amidships, as amidships under the hatch, in fact the scoop works on each side of the steamer freely and not even the tunnel has been found an obstacle to the efficient working of the scoop. A noteworthy feature of the Sieurin winch and gear is that it can be employed for every purpose required of an ordinary ship's winch, while any ship can be equipped with it, whether of special design or of the ordinary type, and the winch and gear take no extra space away from the steamer.

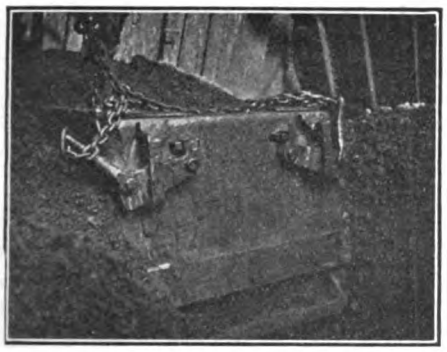


FIG. 1—SCOOP IN THE HOLD FILLED.

the patented device of Capt. Sieurin, of Gothenburg, and principal of the Sieurin Discharging Gear, Ltd., of London, is the most perfect and economical that has up to the present been devised. Speaking generally, the appliances carried by ships for discharging their cargoes, both bulk and otherwise, are in most instances extremely crude. Steamers usually carry on their decks a number of winches, the collective power of

FIG. 2—SCOOP AFTER BEING RAISED FROM THE HOLD, READY TO BE DELIVERED OVERBOARD BETWEEN THE TWO STATIONARY DERRICKS.

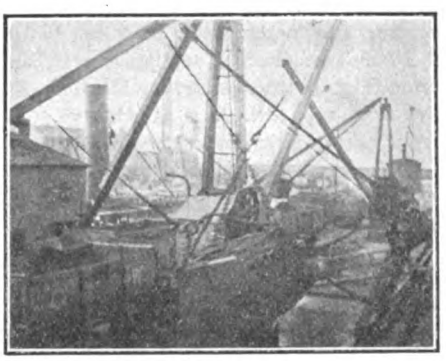


FIG. 3—SCOOP ON THE ROAD TO THE TRUCK ON THE QUAY.

The Sieurin gear was originally designed for coal discharging, and many steamers in Sweden and Germany have been working with it in coal discharging, and up to the present over 700,000 tons of coal and coke have been handled by this gear. The advantages of this system having been made evident in handling coal, which advantages consist in a very great saving in the cost of discharging, and also a very considerable economy in time, the gear has lately been further developed for dealing with ore. The class of mineral that has been so far dealt with has been Spanish and so called washed ore. Two or three years ago it was tried in Scotland to discharge this class of ore by the use of grabs, but the fact was that the weight of the grab was so large in comparison to the quantity of ore it could take, that the use of grabs was found impracticable. Another reason that made the use of grabs unsuitable for this washed ore was that the ore did not run easily and formed into vertical walls. With the Sieurin gear it has now been proved that by comparatively small winches, in the case of the S. S. Paulina, of the same size as when used for dealing with coal, and having cylinders of 8 in. by 10 in. diameter, and a specially constructed scoop, having a capacity of about 2 tons of the above washed ore, very good results have already been obtained. This scoop, when working in the holds, not only takes the cargo vertically under the hatch as the grabs do, but the scoop also travels away to the very far end of the hold, and picks up the ore. All the shoveling by hand is done away with, except at the very last, when cleaning up the hold, when only a few men are necessary. When the scoop has been filled by being dragged in the cargo by the winch, it is hove up out of the hold under the stationary derrick over the hatch at the same time as the steam winch, which is heaving it up, is taking in the slack of another rope leading to the block on

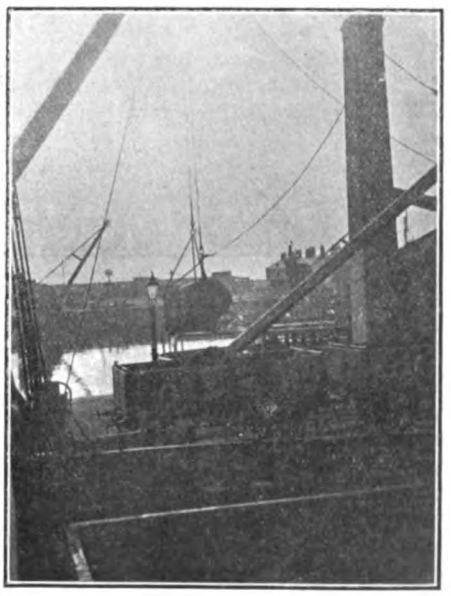


FIG. 4—THE SCOOP HANGING OVER THE TRUCK, READY TO BE EMPTIED.

an overside derrick. This part of the gear may be more fully described as follows: Each set of gear, of which there are eight on the Paulina, consists of two derricks, a special winch and a scoop, with the necessary blocks and ropes. The scoop hangs upon two ropes, one of which leads to each derrick. The latter are stationary, one being fixed over the hatch, and the other over the ship's side, so that by tightening or slackening either of the leads, the scoop may be made to hang plumb in either of these positions. The special feature of the winch is that it is provided with three barrels, the two larger of which

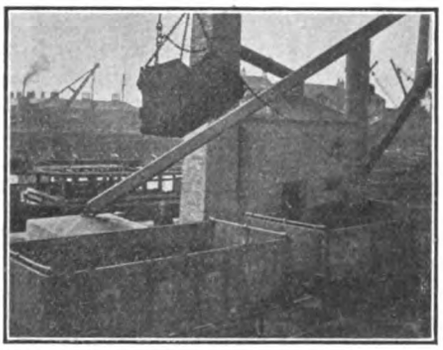


FIG. 5—SCOOP ABOUT TO BE EMPTIED.

are used for lifting and lowering the scoop, moving it sideways and opening the door in the bottom. These two barrels can revolve in the same or opposite directions, as desired. The lifting rope from the center derrick is led under one barrel, while the rope from the overside derrick is led over the other.

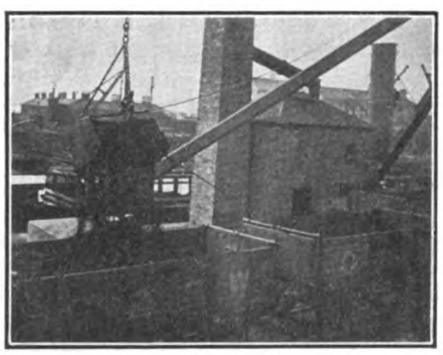
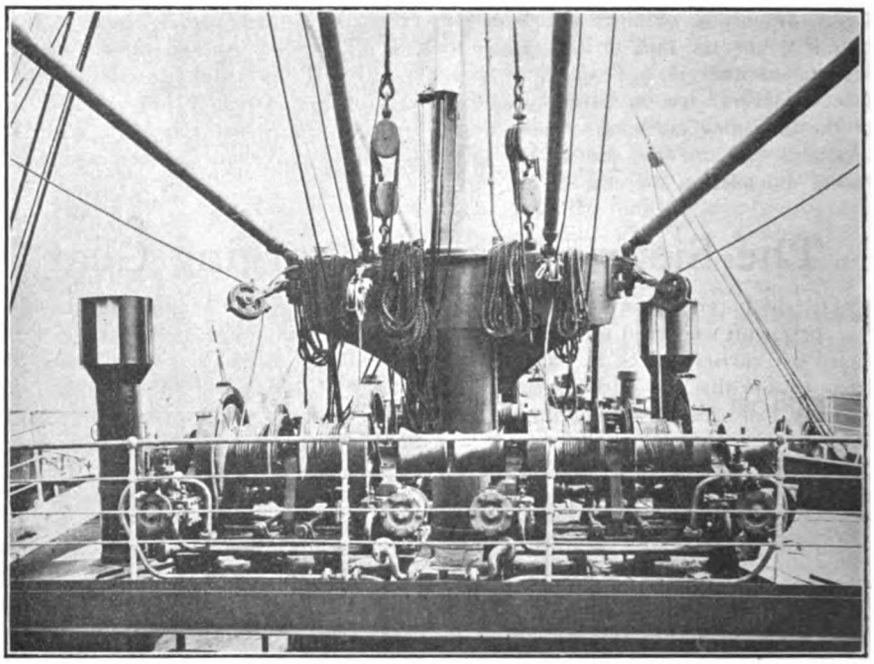


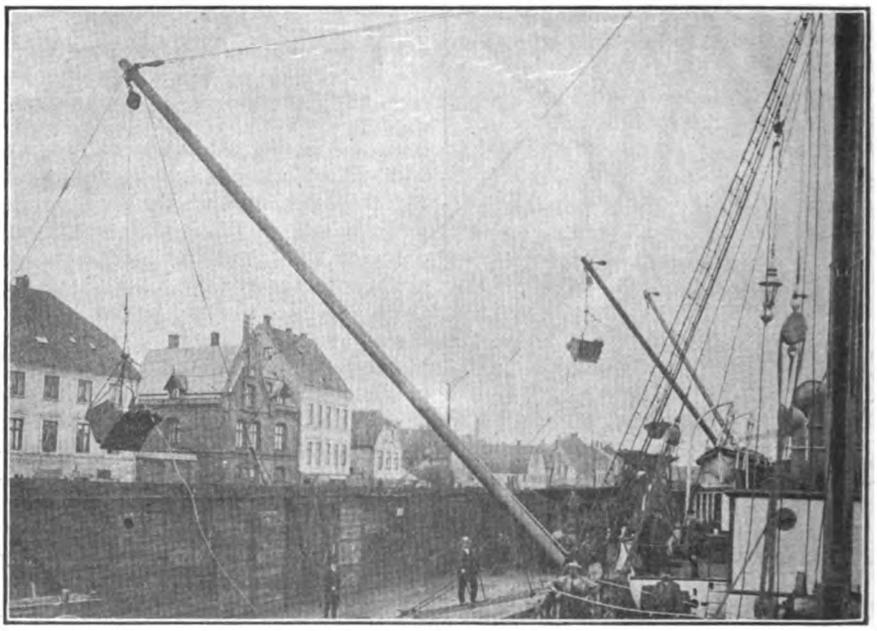
FIG. 6—THE SCOOP HANGING OVER THE TRUCK BEING EMPTIED.

After passing through the blocks of their respective derricks, the other ends of these ropes are permanently shackled together and connected at this junction to the lifting hook. When the load is being lifted by the center derrick, the two barrels revolve in the opposite direction, so that the slack of the overside rope is taken in at the same rate. When the load is clear of the hatch, the lifting barrel is reversed, and the load brought

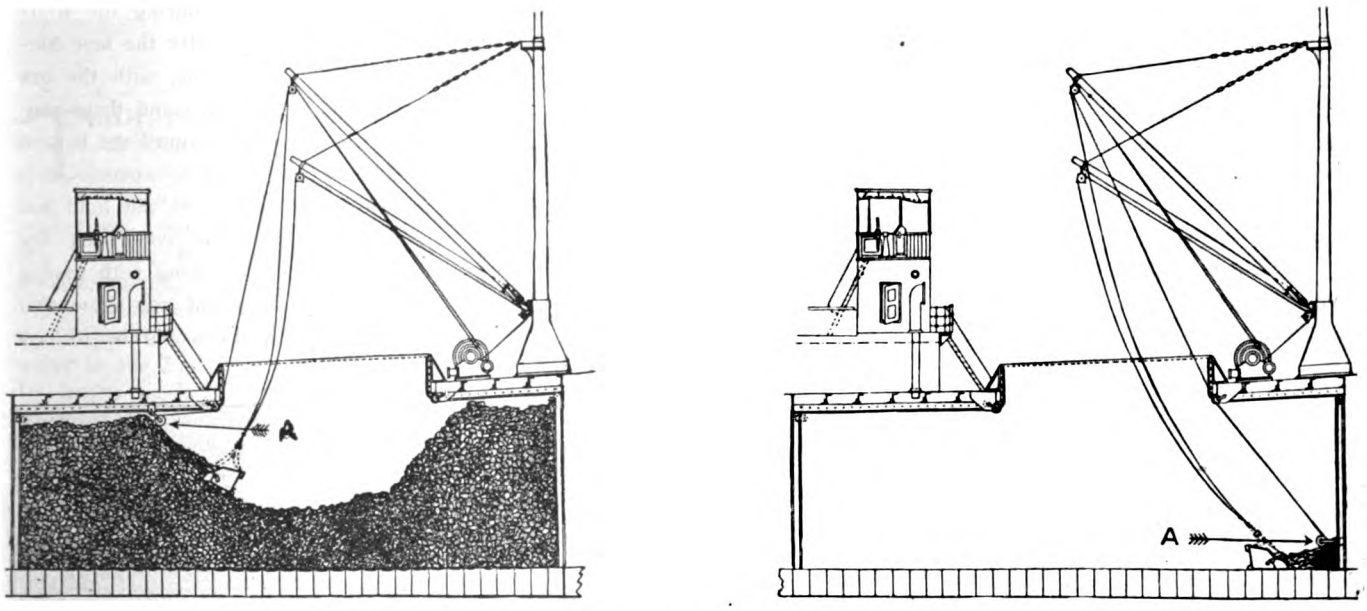


VIEW OF THE SIEURIN WINCHES AND DERRICKS.

across the deck and so far outboard as required, by paying out the lifting rope and taking in the overside rope. When the load is over the ship's side, and has to be lowered, the overside barrel is reversed, and both ropes paid out with the same speed. The smaller barrel can be driven independently, and winds in the drag rope, which is attached to the front of the scoop after passing through the block on the derrick over a roller at the hatch end, and round a movable block (A). The block can be attached in the desired position either on the hatch coaming, deck girder or bulkhead stiffener, as may be required to suit the working out of the ore. The scoop, as before stated, holds about 2 tons of ore, and is so constructed that it may not slide along the top of the cargo without being filled, nor dive down into the ore and turn over. It is provided with a hinged door in the bottom (see illustration), through which it can be emptied, this door being opened by slackening away the lead over the center derrick when the side derrick is holding the weight. While the scoop is being filled and both the lifting ropes are slack, the door is automatically locked to prevent escape of the contents through accidental opening. Practically no hand



THE STEAMER MERCUR DISCHARGING COAL WITH SIEURIN'S PATENT DISCHARGING GEAR AT FLENSBURG.



LONG HOLD WITH SMALL HATCH AND DRAG ROPE ATTACHMENT AT A.

trimming is required, as the scoop has sufficient power behind it to cut its way and fill itself. One set of gear requires the attention of only one man. The cargo, therefore, can be discharged by the ship's own crew without any shore assistance, the shoveling is done away with, the use of winches on the dock quay is unnecessary, and from results already obtained it has been proved that ore can be discharged by the Sieurin gear for the triple of between 2 cents to 4 cents per ton for purely labor. Even this small cost has been materially reduced when the ship's own crew have worked the gear. A feature of this gear not to be overlooked is that the ship need not be specially designed for it. It can be adapted to every type of cargo carrier, and the winch can be as successfully and profitably employed in raising and discharging general cargo from the hold as in working the scoop in bulk cargoes. Regarding the quantity of ore that this gear is capable of dealing within a given time, its working on the Paulina must be again cited. This ship is fitted with gear working four scoops, that is one for each hold. It has been found possible to deliver with ease about 35 tons of ore per hour into wagons for each scoop, or 140 tons per hour, and this was accomplished by eight men, one at each winch, for the best part of the time, and delivered a distance of 25 ft. from the ship's side. Of course, this quantity would be proportionately increased if the scoop has a less distance to travel. The winches utilized the power standing ready at hand on the steamer, and it will be seen that vessels fitted with this gear are made quite independent of any appliances on the quay. Another instance of the capacity of the gear may be cited. Swedish steamers equipped with it, and loaded with coal, have been able to discharge quicker than the wagons could be supplied, but when the discharge has been made overside into barges, no delay has been experienced. The steamer St. Paul, with the Sieurin gear, discharged 4,000 tons of coal in 20 working hours, and this at a cost of only 2 cents per ton for labor. This ship, during the long labor strike in Sweden some time ago, was able to discharge without the aid of the shore staff, mainly through having been installed with the Sieurin gear.

It seems safe to predict that the Sieurin system will be extensively adopted in steamers carrying bulk cargoes not only on the score of economy, but also on account of the fact that vessels fitted with the gear are largely independent of labor and its consequent troubles.

Fig. 1 represents the scoop having been filled in the manner before stated, and Fig. 2 shows the same scoop hove up out of the hold above the hatch coamings. In this illustration one of the winches is seen, and by it is standing the winchman close up to the hatch coaming, and is thus able to see down into the hold. Fig. 3 shows the scoop traveling between the two ropes from the center derrick over the hatch, and the other one from the side derrick over the wagon. By means of this third rope the winchman is able to open the bottom of the scoops at any required height over the wagon or barge alongside. Fig. 4 shows the scoop hanging over a wagon, in this case about 25 ft. away from the ship's side, ready to be opened, and here it may be remarked that on one occasion, when discharging coal, the gear emptied the scoop a distance of 45 ft. from the ship's side.

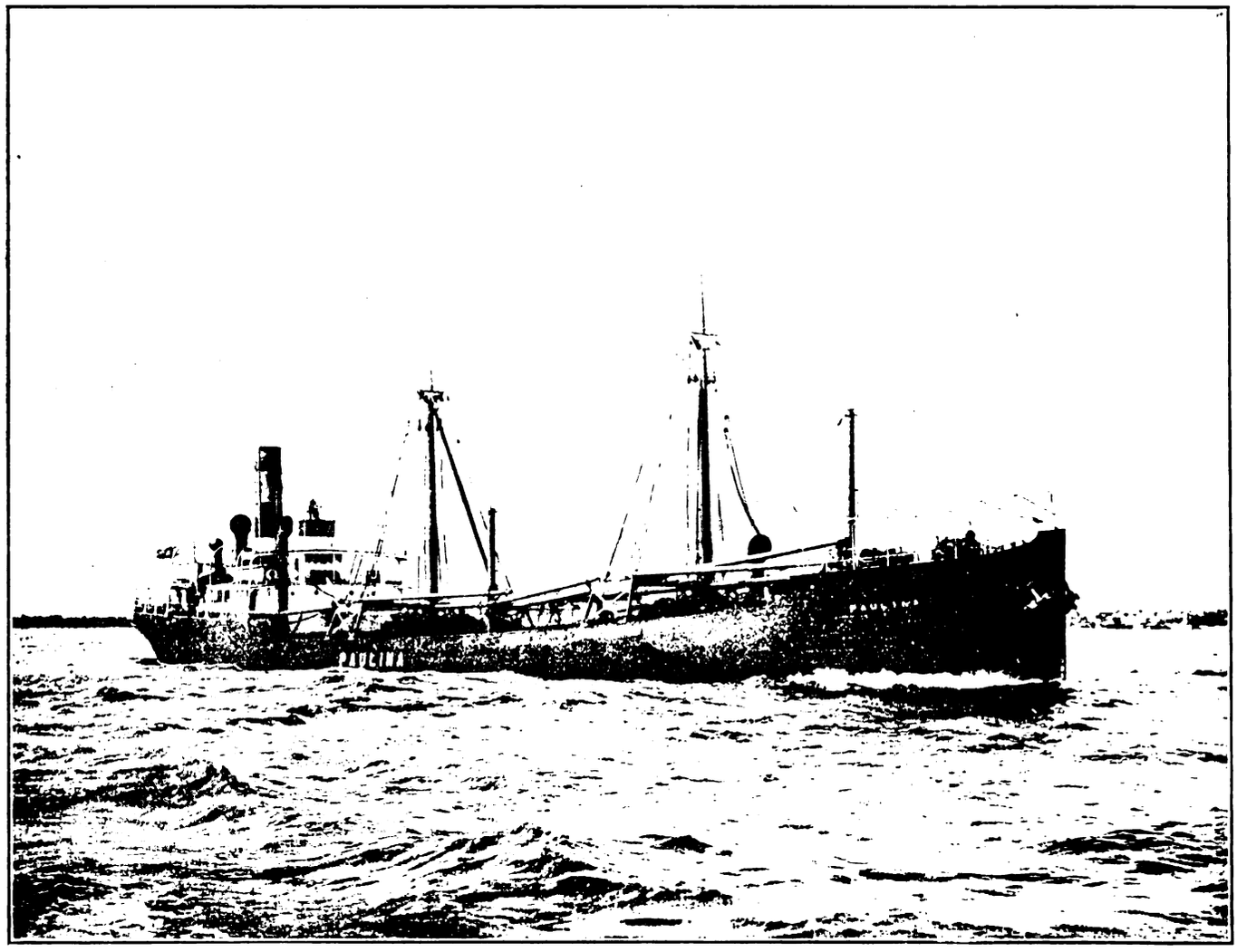
Fig. 5 is another view of the scoop in the same position, and Fig. 6 shows the scoop discharging its contents in a wagon.

The steamer Paulina was built by Sir Raylton Dixon & Co., of Cleveland dock yards, Middlesbrough, and constructed on their patent cantilever frame system with topside water ballast tanks to the order of Messrs. Modesto, Pineiro & Co., of Santander, Spain, to meet the very special requirements of her owners' iron ore carrying trade from Santander to Glasgow. The vessel has been built to Lloyds Highest Class, with engines aft, her leading dimensions being 300 ft. by 47 ft. 3 in. by 22 ft. 3 in., molded, and she will carry about 4,300 tons, on 19 ft. draught, with the remarkably low net register of 1,386 tons. About 840 tons of water ballast is carried in cellular double bottom and fore and aft peaks, and in addition to this, the triangular tanks at the top of each side of the holds will contain another 720 tons. The sloping sides ot these tanks next to the holds constitute a self-trimming arrangement when the ship is carrying coal, as she will do on her return voyages to Santander. The hatchways are of enormous size, as much as 26 ft. wide and 30 ft. long. Each of these hatchways is covered with portable steel covers, which are easily removed in five lifts by the derricks and require no tarpaulins. The holds, being absolutely unobstructed by any beams, pillars, webs or stringers, are admirably adapted for discharging cargo by means of 19 derricks, fitted with Sieurin's patent cargo discharging gear, worked by eight steam winches, constructed to Capt. Sieurin's

latest design. Triple expansion engines having cylinders 21½, 36 and 59 by 39 in. stroke, supplied with steam by three large single ended boilers, working at 180 lb. pressure, have been fitted by the Northeastern Marine Engineering Co., Sunderland.

THE HANDLING OF IRON ORE AT GLASGOW.

The discharging of ore, especially Spanish ore, which is hard and lumpy, entails a considerable amount of manual labor. In an ordinary vessel, 18 men are often employed in the main hold. The work of filling the buckets is very arduous, and carried on with a considerable amount of risk of accident from lumps of ore falling out of the buckets when being hoisted out of the hatchway. A little time ago, some interesting experiments were made with three different kinds of automatic digger grabs, and one ordinary tipping bucket discharging iron ore at Queen's dock. For two of these grabs special apparatus were fitted to one of the five-ton steam cranes on the quay, while the other grab required no fittings beyond the ordinary hook. The tipping bucket was worked by a similar crane. The grabs, however, weighed each about 70 per cent, while the weight of the tipping bucket was only 24 per cent of the gross load raised. One of the grabs required a drop of several feet to enable the teeth to penetrate the ore, the result being that when nearing the bottom of the hold, there was considerable risk of damage to the tank top, and when within a few feet of the bottom, its use had to be discontinued. The cost of discharging 1,000 tons of ore varied as follows: For the first grab, £10 4s 9d; for the second grab, £14; for the third, £12 2s 10d; and for the tipping bucket, £19 11s; the corresponding times were respectively 35.7, 51.3, 43.1 and 29.4 hours. In comparing the work done by the grabs as against the tipping buckets, it should be noted that during the trials grabs were working under the best conditions for them—that is, with the ore directly under the hatch—and these conditions were maintained until the bottom of the hold was reached, whereas it is only after the bottom of the hold has been reached that the conditions are most favorable for working with tipping buckets. The trials did not show that the use of the grabs would be of any advantage. There are many types of vessels engaged in the ore trade, some with small hatches with 'tween decks, and nearly all with engines amidships, necessitating tunnels in the after holds. Special types of ore carriers are, however, now being built with the propelling machinery aft, and the holds and hatches constructed to facilitate the working of grabs and other systems of discharging with greater rapidity and economy.



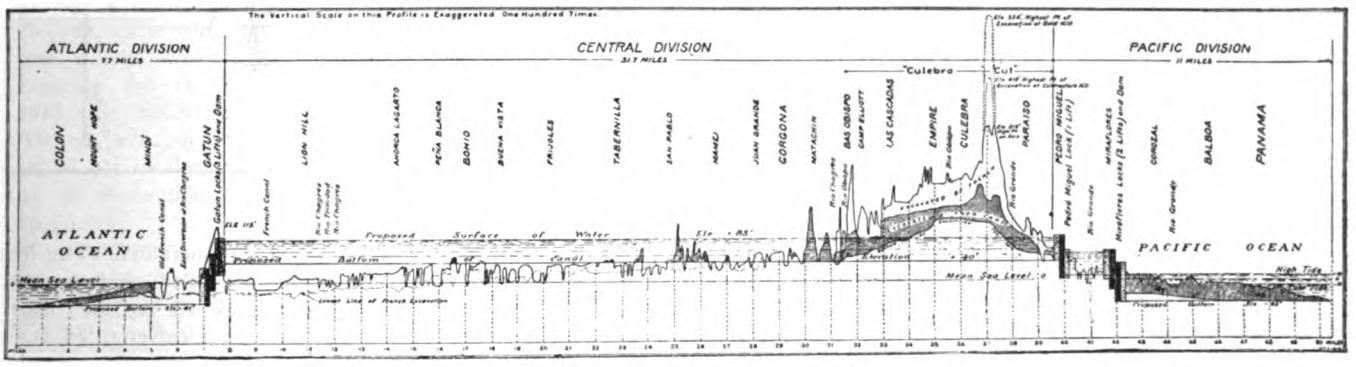
THE STEAMER PAULINA EQUIPPED WITH SIEURIN'S DISCHARGING GEAR.

The Panama Canal

THE Isthmian Canal Commission has just issued a little brochure on the Panama Canal, setting forth its salient features as a matter of general information. From this brochure the following facts have been extracted:

The entire length of the Canal from deep water in the Atlantic to deep water in the Pacific is about 50½ miles. Its length on land is about 40½ miles.

In passing through it from the Atlantic to the Pacific, a vessel will enter a channel with a bottom width of 500 ft. in Limon Bay, follow this for about seven miles to Gatun, where it will enter a series of three locks in flight and be lifted 85 ft. to the level of Gatun Lake. It will sail at full ocean speed through this lake, in a channel varying from 1,000 to 500 ft. in width, for a distance of about 24 miles, to Bas Obispo, where it will enter the Culebra Cut. It will sail through the Cut, a distance of about nine miles, in a channel with a bottom width of 300 ft., to Pedro Miguel. There it will enter a lock and be lowered 30 1/3 ft. to a small lake, at an elevation of 54 2/3 ft. above sea level, and will sail through this for about 1½ miles to Miraflores. There it will enter two locks in series and be lowered to sea level, passing out into the Pacific through a channel, about 8½ miles in length, with a bottom width of 500 ft. The depth of the approach channel on the Atlantic side, where the tidal oscillation does not exceed 1½ ft., will be 41 ft. at mean tide, and on the Pacific side, where the maximum oscillation is 23 ft., the depth will be 45 ft. at mean tide.



PROFILE OF CANAL.

Gatun Dam.

The Gatun Dam, which will form Gatun Lake by impounding the waters of the Chagres and others streams, will be nearly 1½ miles long, measured on its crest, nearly ½ mile wide at its base, about 400 ft. wide at the water surface, about 100 ft. wide at the top, and its crest, as planned, will be at an elevation of 115 ft. above mean sea level, or 30 ft. above the normal level of the lake. The interior of the dam will be formed of a natural mixture of sand and clay, dredged by hydraulic process from pits above and below the dam, and placed between two large masses of rock and miscellaneous material, obtained from steam shovel excavation at various points along the canal. The top and upstream slope will be thoroughly riprapped.

The Spillway is a concrete lined opening, 1,200 ft. long and 300 ft. wide, cut through a hill of rock nearly in the center of the dam, the bottom of the opening being 10 ft. above sea level. During the construction of the dam, all the water discharged from the Chagres and its tributaries will flow through this opening. When construction has sufficiently advanced to permit the lake to be formed, the Spillway will be closed with a concrete dam, fitted with gates and machinery for regulating the water level of the lake.

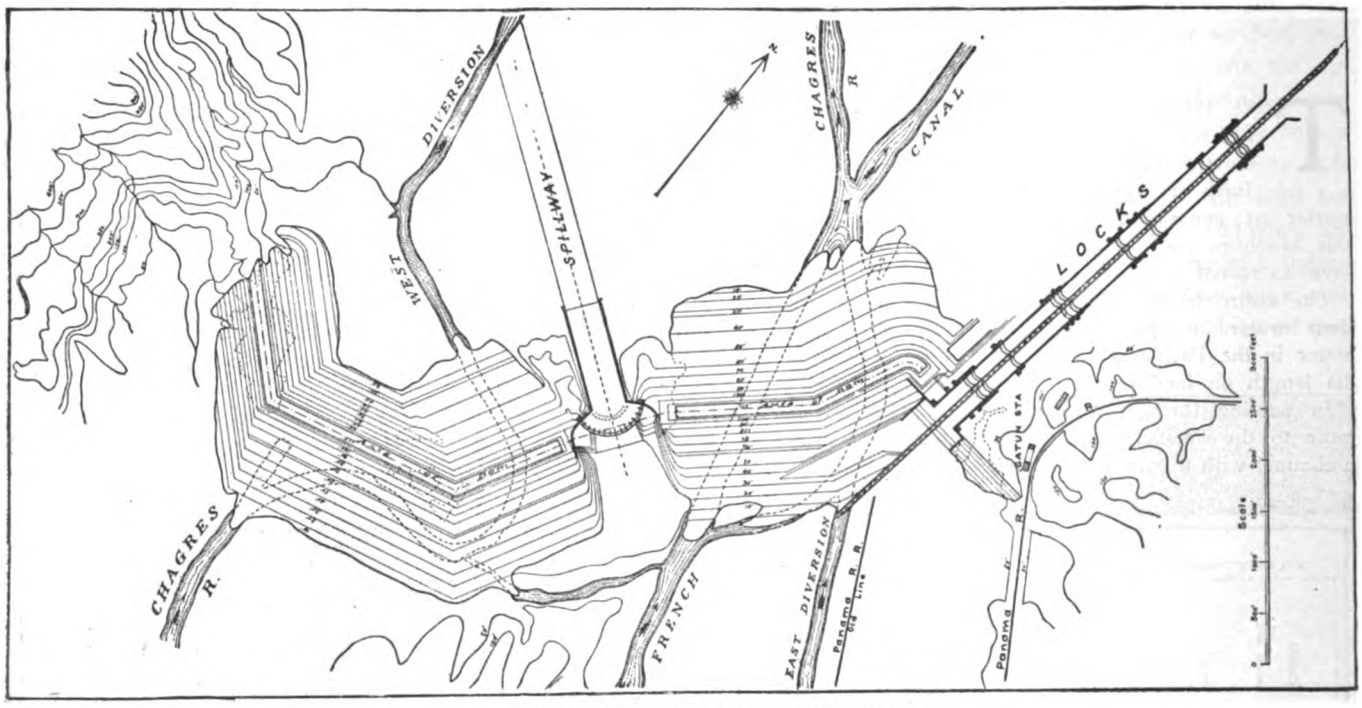
Dams on Pacific Side.

The water level of Gatun Lake, extending through the Culebra Cut, will be maintained at the south end by an earth dam connecting the locks at Pedro Miguel with the high ground to the westward, about 1,700 ft. long, with its crest at an elevation 105 ft. above mean tide.

A small lake between the locks at Pedro Miguel and Miraflores will be formed by dams connecting the walls of Miraflores locks with the high ground on either side. The dam to the westward will be of earth, about 2,700 ft. long, having its crest about 15 ft. above the water in Miraflores Lake. The east dam will be of concrete, about 500 ft. long, and will form a spillway for Miraflores Lake, with crest gates similar to those at the spillway of the Gatun dam.

Canal Statistics.

Length from deep water to deep water	50½	miles.
Length on land	40½	miles.
Bottom width of channel, maximum	1,000	ft.
Bottom width of channel, minimum, 9 miles, Culebra Cut	300	ft.
Locks, in pairs	12	
Locks, usable length	1,000	ft.
Locks, usable width	110	ft.
Gatun Lake, area	164	sq. m.
Gatun Lake, channel depth	85 to 45	ft.
Excavation, estimated total	174,666,594	c. y.
Excavation, amount accomplished April 1, 1910	103,205,666	c. y.
Excavation by the French	78,146,960	c. y.
Excavation by French, useful to present Canal	29,908,000	c. y.
Concrete, total estimated for Canal	5,000,000	c. y.
Time of transit through completed Canal	10 to 12	hours.
Time of passage through locks	3	hours.
Relocated Panama Railroad, estimated cost	$7,225,000	
Relocated Panama Railroad, length	46.2	miles.
Canal Zone, area	about 448	sq. m.
Canal Zone area, owned by United States	about 322	sq. m.
French buildings, number acquired	2,150	
French buildings, number used	1,537	
French buildings, net value when acquired	$1,959,203	
Value of utilized French equipment	$1,000,000	
Canal force, actually at work	about 39,000	
Canal force, Americans	about 5,500	
Cost of Canal, estimated total	$375,000,000	
Work begun by Americans	May 4, 1904	
Date of completion	Jan. 1, 1915	



GATUN DAM, SPILLWAY AND LOCKS.

Gatun Lake.

Gatun Lake will cover an area of 164 square miles, with a depth in the ship channel varying from 85 to 45 ft. Throughout the first 16 miles from Gatun, the width of the channel will be 1,000 ft.; then for 4 miles, it will be 800 ft., and for 4 miles more 500 ft., when the entrance to Culebra Cut, at Bas Obispo, will be reached. The water level in the Cut will be that of the lake, and the bottom width of the channel will be 300 ft.

The Canal Zone.

The canal zone contains about 448 square miles. It begins at a point three marine miles from mean low water mark in each ocean, and extends for five miles on each side of the center line of the route of the canal. It includes the group of islands in the bay of Panama named Perico, Naos, Culebra and Flamenco. The cities of Panama and Colon are excluded from the zone, but the United States has the right to enforce sanitary ordinances in those cities, and to maintain public order in them in case the Republic of Panama should not be able, in the judgment of the United States, to do so.

Of the 448 square miles of zone territory, the United States owns about 322 square miles. Under the treaty with Panama, the United States has the right to acquire by purchase, or by the exercise of the right of eminent domain, any lands, buildings, water rights or other properties necessary and convenient for the construction, maintenance, operation, sanitation and protection of the canal, and it can, therefore, at any time, acquire the 126 square miles within the zone boundaries, which are now owned by private persons.

The Locks.

There will be 12 locks in the canal, all in duplicate; three pairs in flight at Gatun, with a combined lift of 85 ft.; one pair at Pedro Miguel, with a lift of 30 1/3 ft., and two pairs at Miraflores, with a combined lift of 54 2/3 ft. at mean tide. The dimensions of all are the same—a usable length of 1,000 ft., and a usable width of 110 ft. Each lock will be a chamber, with walls and floor of concrete, and watertight gates at each end.

The side walls will be 45 to 50 ft. wide at the surface of the floor; will be perpendicular on the face, and will narrow from a point 24 1/3 ft. above the floor until they are 8 ft. wide at the top. The middle wall will be 60 ft. wide, approximately 81 ft. high, and each face will be vertical. At a point 42 1/3 ft. above the surface of the floor, and 15 ft. above the top of the middle culvert, this wall will divide into two parts, leaving a space down the center much like the letter "U," which will be 19 ft. wide at the bottom. In this center space, which will be 44 ft. wide at the top, will be a tunnel divided into three stories, or galleries. The lowest gallery will be for drainage; the middle, for the wires that will carry the electric current to operate the gate and valve machinery, which will be installed in the center wall; and the upper will be a passageway for the operators. The lock chambers will be filled and emptied through lateral culverts in the floors, connecting with main culverts, 18 ft. in diameter, in the walls, the water flowing in and out by gravity. (See cut.)

The lock gates will be steel structures 7 ft. thick, 65 ft. long, and from 47 to 82 ft. high. They will weigh from 300 to 600 tons each. Ninety-two leaves will be required for the entire canal, the total weighing 57,000 tons. Intermediate gates will be used in the locks, in order to save water and time, if desired, in locking small vessels through, the gates being so fixed as to divide the locks into chambers 600 and 400 ft. long, respectively. Ninety-five per cent of the vessels navigating the high seas are less than 600 ft. long. In the construction of the locks, it is estimated that there will be used approximately 4,500,000 cu. yds. of concrete, requiring about the same number of barrels of cement.

No vessel will be permitted to enter or pass through the locks under its own power. Electricity will be used to tow all vessels into and through the locks, and to operate all gates and valves, power being generated by water turbines from the head created by Gatun Lake.

The time required to pass a vessel through all the locks is estimated at 3 hours, 1½ hour in the three locks at Gatun, and about the same time in the three locks on the Pacific side. The time of passage of a vessel through the entire canal is estimated as ranging from 10 to 12 hours, according to the size of the ship, and the rate of speed at which it can travel.

Excavation.

The total excavation, dry and wet, for the canal, as originally planned, was estimated at 103,795,000 cu. yds., in addition to the excavation by the French companies. Changes in the plan of the canal, made subsequently by order of the President, increased the amount to 174,666,594 cu. yds. Of this amount, 89,794,493 cu. yds. were to be taken from the central division, which includes the Culebra Cut. Active excavation work on a large scale did not begin till 1907, when 15,765,290 cu. yds. were removed. In 1908, over 37,000,000 cu. yds. were removed, and in 1909, over 35,000,000, making a total for the two years of over 72,000,000 cu. yds., or a monthly average for those two years of 3,000,000 cu. yds. The total for these two years was nearly one-half of the entire excavation for the canal. On April 1, 1910, the excavation exceeded 103,000,000 cu. yds., nearly the entire amount called for in the original plan. Records of all excavation to April 1, 1910, are appended:

	Cu. Yds.
By French Companies	78,146,960
French excavation useful to present Canal	29,908,000
By Americans—	
Dry excavation	63,785,629
Dredges	39,420,037
Total	103,205,666
May 4 to Dec. 31, 1904	243,472
Jan. 1 to Dec. 31, 1905	1,799,227
Jan. 1 to Dec. 31, 1906	4,948,497
Jan. 1 to Dec. 31, 1907	15,765,290
Jan. 1 to Dec. 31, 1908	37,116,735
Jan. 1 to Dec. 31, 1909	35,096,166
Jan. 1 to April 1, 1910	8,236,279

Excavation by Divisions.

May 4, 1904, to April 1, 1910.

Divisions.	Amount Excavated. Cu. Yds.	Amount Excavated. Total.	Estimated Amount Yet to be Excavated. Cu. Yds.	Estimated Amount Yet to be Excavated. Total.
Atlantic—				
Dry excavation	6,791,280		2,770,631	
Dredges	17,574,568	24,365,848	15,940,831	18,711,462
Central—				
Culebra Cut	45,624,605		32,417,690	
All other points	8,655,533	54,280,138	3,096,665	35,514,355
Pacific—				
Dry excavation	2,714,211		3,216,369	
Dredges	21,845,469	24,559,680	14,018,742	17,235,111
Grand total		103,205,666		71,460,928

There have been expended for pavements, water works, sewers, etc., in the cities of Panama and Colon about $2,500,000, and work under an additional appropriation of $800,000 is now in progress in these cities, making $3,300,000 in all. This sum will be returned to the United States treasury by water rates collected by the United States during a period of 50 years.

Canal Force.

On March 23, 1910, the total force of the Isthmian Canal Commission and Panama Railroad Co., actually at work, was 38,732, divided as follows:

	Gold.	Silver.	Total.
Isthmian Canal Commission	4,409	26,217	30,716
Panama Railroad Company (proper)	557	3,336	3,893
Panama Railroad Relocation	158	3,000	3,158
Panama Railroad Commissary	215	750	965
Total	5,429	33,303	38,732

The gold force is made up of the officials, clerical force, construction men, and skilled artisans of the Isthmian Canal Commission and the Panama railroad. Practically all of them are Americans. The silver force represents the unskilled laborers of the Commission and the Panama railroad. Of these, about 5,000 are Europeans, mainly Spaniards, with a few Italians and other races. The remainder, about 28,000, are West Indians, about 4,000 of whom are employed as artisans, receiving 16, 20 and 25 cents, and a small number, 32 and 40 cents, an hour. The standard rate of the West Indian laborer is 10 cents an hour, but a few of these doing work of an exceptional character are paid 16 and 20 cents. The larger part of the Spaniards are paid 20 cents an hour, and the rest 16 cents an hour.

Canal Appropriations and Expenditures.

Appropriations.

Payment to the New Panama Canal Co.	$40,000,000.00
Payment to Republic of Panama	10,000,000.00
Appropriation for 1902	10,000,000.00
Appropriation for 1906	11,000,000.00
Deficiency for 1906	5,990,786.00
Appropriation for 1907	25,456,415.08
Appropriation for 1908	27,161,367.50
Deficiency for 1908	12,178,900.00
Appropriation for 1909	29,187,000.00
Deficiency for 1909	5,458,000.00
Appropriation for 1910	33,638,000.00
Total to date	$210,070,468.58

Classified Expenditures to March 1, 1910.

Department of Construction and Engineering	$63,143,128.14
Department of Construction and Engineering, Plant	22,471,687.32
Department of Sanitation	10,884,410.18
Department of Civil Administration	3,926,853.36
Panama Railroad Second Main Track	1,107,910.78
Panama Railroad Relocated Line	4,354,137.56
Purchase and Repair of Steamers	2,555,009.17
Zone Water Works and Sewers	3,270,248.92
Zone Roadways	1,429,752.65
Loans to Panama Railroad Co.	3,718,567.03
Construction and Repair of Buildings	9,574,865.12
Miscellaneous	3,960,658.21
Total	$130,397,228.44

Equipment.

Canal Service.

Steam shovels:		
103-ton	14	
95-ton	32	
70-ton	35	
66-ton	7	
45-ton	10	
26-ton	1	
Trenching shovel	1	100
Cars:		
Used with unloading plows	1,806	
Steel dump	1,800	
General service	525	4,131
Locomotives:		
French	119	
American	160	279
Unloaders		30
Spreaders		24
Track shifters		10
Cranes		35
Pile drivers		16
Dredges:		
Rebuilt French ladder	7	
Dipper	3	
Pipe-line suction	6	
Sea-going suction	2	18
Subaqueous rock breaker		1
Tugs		9
Towboat		1
Tender		1
Clapets		12
Barges		39

Panama Railroad.

Locomotives		68
Cars:		
Coaches	56	
Freight	1,495	
Locomotive cranes		4
Pile drivers		2
Tugs		2
Crane boat		1
Lighters, steel		14

Old French Buildings.

The Americans acquired from the French 2,150 buildings of various kinds. Of this number, 1,537 have been placed in use. Their estimated value at the time they were turned over to the Americans was about $2,000,000. The Commission has spent on these buildings about $890,000, making their value today about $2,890,000.

Subsistence Department.

The Subsistence Department is divided into two branches—commissary and hotel. It does about $7,000,000 worth of business a year, two-thirds of this through the commissaries and one-third through the hotels. It feeds, clothes and provides with necessities, approximately 50,000 persons. The department is self-sustaining.

The commissary system consists of 13 general stores in as many Canal Zone villages, and three camps along the relocated line of the Panama railroad. No goods are sold for cash, only coupons issued to employes being accepted in payment for purchases.

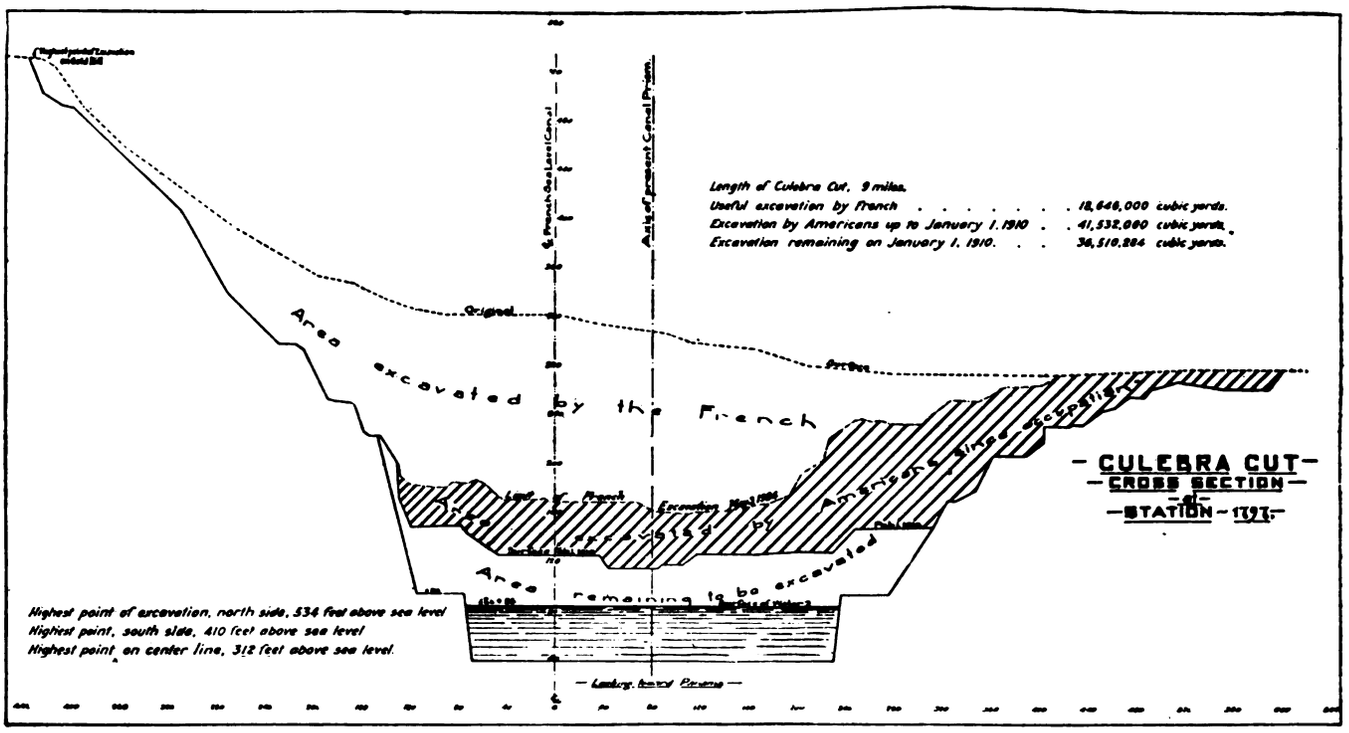
The hotel branch maintains the Hotel Tivoli at Ancon, and also 18 hotels for

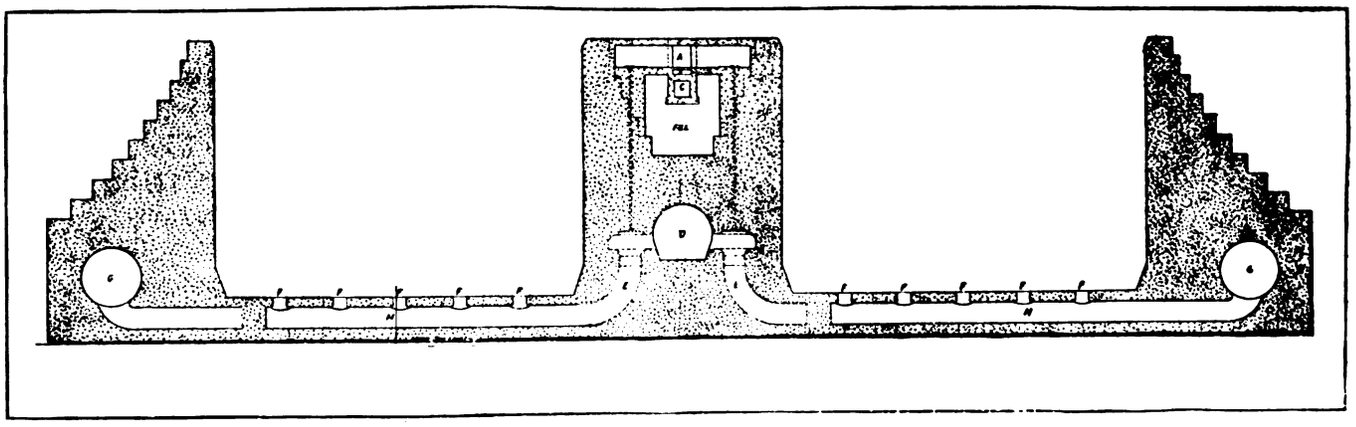
white gold employes, at which meals are served for 30 cents each; 18 messes for European laborers, who pay 40 cents per ration of three meals, and 17 kitchens for West Indian laborers, who are charged 30 cents per ration of three meals. There are served monthly in the hotels for white gold employes, 188,000 meals; in the messes, 269,000 meals; and in the kitchens, 180,000 meals. The supplies for one month cost about $90,000; labor and other expenses, $21,000. The monthly receipts, exclusive of the revenue from the Hotel Tivoli at Ancon, amount to $112,000.

A cold storage and ice making plant, bakery, coffee roaster, ice cream factory, and similar plants, and a laundry, are operated at Cristobal, and warehouses are maintained there near the wharves, at which goods from the States are delivered. Every morning a supply train takes ice and foodstuffs to the towns along the line of the canal, the perishable goods being conveyed in refrigerated cars.

Re-located Panama Railroad.

The new, or relocated line of the Panama railroad is 46.2 miles long, or about 1 mile shorter than the old line. From Colon to Mindi, 4.17 miles, and from Corozal to Panama, 2.83 miles, the old location is used, but the remaining 36 miles are new road. From Mindi to Gatun, the railroad runs in general parallel to the canal, and the maximum grade of the line, 1¼ per cent, is in this stretch, where the ascent from nearly mean sea level to 95 ft. above is made. At Gatun, the road leaves the vicinity of the canal and runs east along the valley of the Gatun river to a point about 4½ miles from the center line of the canal, where it turns southward again, and skirts the east shore of Gatun Lake to the beginning of Culebra Cut, at Bas Obispo. In this section, there are several large fills, and the maximum elevation of the line is reached, 110 ft. above mean sea level. Through Culebra Cut, the road will run on a berm on the east side, 10 ft. above the surface of the water. From the south end of Culebra Cut, at Paraiso, it will run practically parallel with the canal to Panama. The maximum grade between Gatun and Panama is 0.45 per cent, and the maximum curvature is 6 degrees. Where the railroad crosses the Gatun river, a bascule steel bridge is to be erected, and a steel girder bridge, ¼ mile long with a 200-ft. truss channel span, is in use across the Chagres river at Gamboa. Smaller streams are crossed on concrete culverts. Near Miraflores, a tunnel 736 ft. long has been built through a hill. The cost of the new line is estimated at $7,225,000.





CROSS SECTION OF LOCK CHAMBER AND WALLS OF LOCKS.

A, passageway for operators; B, gallery for electric wire; C, drainage gallery; D, culvert in center wall; E, these culverts run under the lock floors and alternate with those from side walls; F, wells opening from internal culvert into lock chamber; G, culverts in side walls; H, lateral culvert.

New Steamers for Department of Corrections of New York

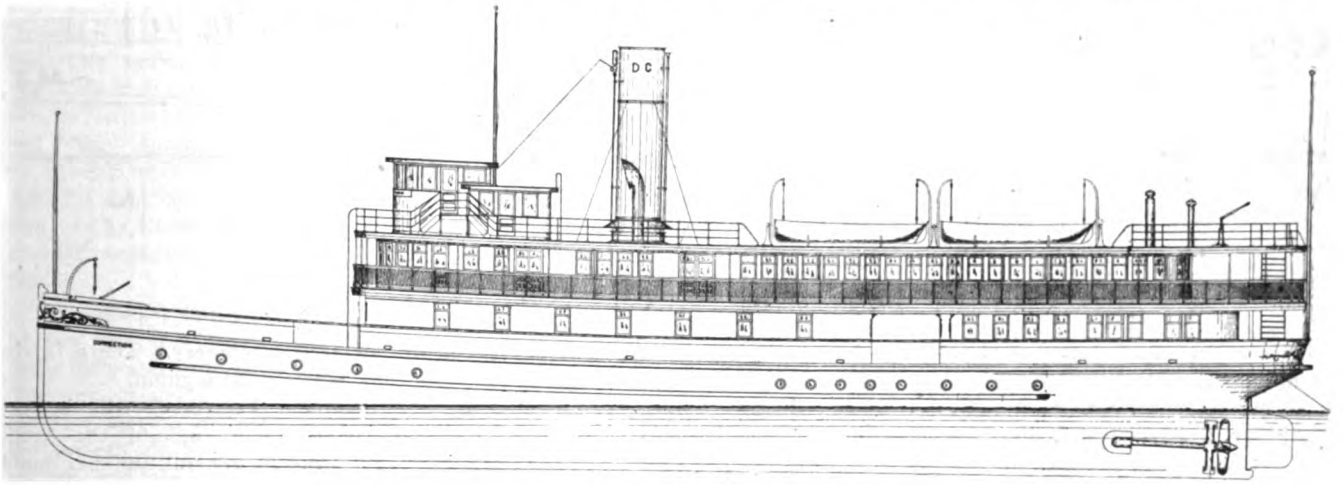
THE outboard profiles of three wooden steamers, recently designed by M. C. Furstenau, 80 Broad street, New York, for the Department of Correction, of the city of New York, are presented herewith. The three boats are intended for use in the harbor of New York, for transferring passengers, prisoners, supplies, etc., for and between the various institutions under control of the department.

The steamer Correction has a length of 166 ft. on deck; beam, molded, 36 ft.; depth, molded, 13 ft.; draught, loaded, 8 ft.; and a speed of about 15 statute miles per hour. The John W. Sullivan Co., New York City, has the contract for building, and the hull and joiner work have been sublet to Robt. Palmer & Sons, Noank, Conn. The hull and joiner work throughout is to be of the very best obtainable material. The frames, keel and keelsons are of oak; planking of long leaf yellow pine, and the joiner work generally of white pine. Commissioner's rooms, captain's room and pilot house are finished in quartered oak.

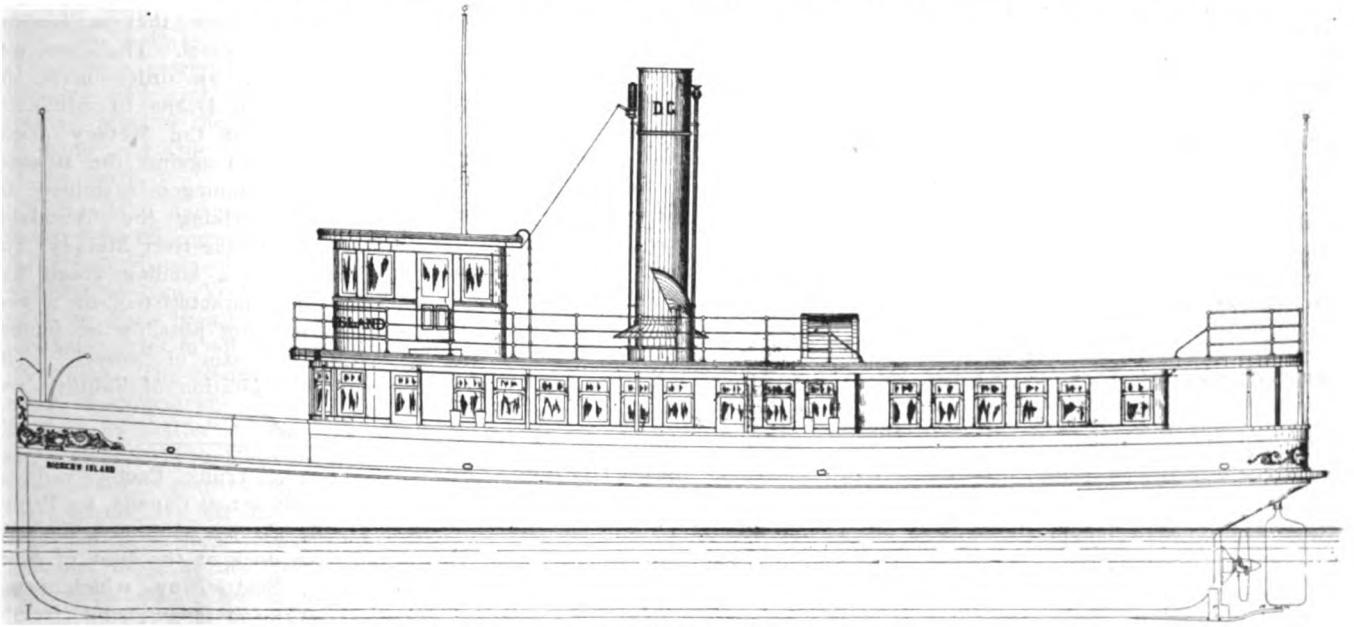
The steamer is fitted with twin screws, driven by two sets of two-crank compound engines, with cylinders 15 and 30 in. diameter, 20 in. stroke. There are two boilers, 12 ft. 6 in. diameter, 12 ft. long, built for a working pressure of 150 lbs. A complete electric light plant, as well as a large fire pump supplying water to monitors for fire fighting purposes are to be fitted. The contract price for the Correction is $98,000.

The steamer Riker's Island has a length of 81 ft. on deck; beam, molded, 18 ft.; depth, molded, 8 ft.; draught, 5 ft.; speed, about 12 miles per hour. The contract was awarded to the Waters-Colver Co., West New Brighton, Staten Island, at $30,000. The propelling machinery consists of a two-crank compound engine, with cylinders 9 and 20 in. diameter and 16 in. stroke, with a fire box boiler 7 ft. diameter, 11 ft. long, built for a working pressure of 150 lbs. The same general description as to hull and joiner work of the steamer Correction applies to the Riker's Island.

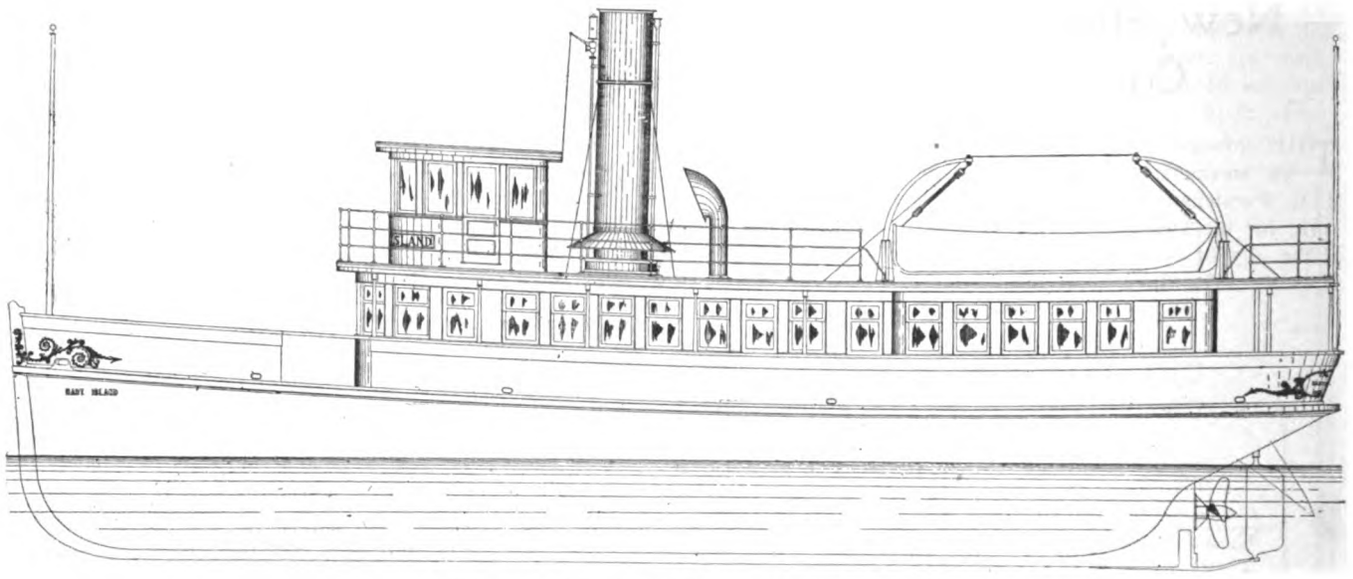
The third and smallest steamer, named Hart Island, is also being built by the Waters-Colver Co., the contract price being $20,000. The machinery equip-



OUTBOARD PROFILE OF STEAMER CORRECTION.



OUTBOARD PROFILE OF STEAMER RIKER'S ISLAND.



OUTBOARD PROFILE OF STEAMER HART ISLAND.

ment will consist of a two-crank compound engine, with cylinders 8½ and 17 in. diameter, 12 in. stroke, with a fire box boiler 6 ft. diameter, 10 ft. long, built for a working pressure of 150 lbs.

The John H. Dialogue & Sons Co., Camden, N. J., is also building a steel tug from designs by Mr. Furstenau, for the Hainesport Mining & Transportation Co., Hainesport, N. J. The tug has a length of 86 ft. 6 in. on deck; beam, molded 20 ft.; depth, molded, 10 ft., and is being built in excess of the requirements of the Bureau Veritas. The machinery equipment consists of a two-crank compound engine, with cylinders 15 and 30 in. diameter, 20 in. stroke, with a fire box boiler 9 ft. 6 in. diameter, 13 ft. long, built for a working pressure of 150 lbs. A complete electric light plant, with search light, large fire pump for fire fighting purposes and a large centrifugal pump for wrecking purposes are also included in the equipment. The contract price for this tug was $38,000.

PASSENGER STEAMER CARTHAGE.

The mail and passenger steamer Carthage was launched from the Neptune works, Newcastle-on-Tyne, of Swan, Hunter & Wigham Richardson, Ltd., on Monday, April 25. The vessel is being built for the Cie. Generale Transatlantique, of Paris, and is intended for their service between Marseilles and Algeria.

She is a handsomely modeled twin-screw steamer, over 400 ft. in length by over 51 ft. beam, propelled by two sets of four-crank triple-expansion engines, on the well-known Yarrow, Schlick & Tweedy system, supplied by eight single-ended boilers fitted with Howden's system of forced draft.

The speed of the vessel will be 19 knots.

The passenger accommodation is of the most luxurious description. The first-class passenger staterooms, including de luxe rooms, for 170 passengers in all, are situated amidships. They are supplied with dining saloon, lounge, smoking room, etc., etc., on the furnishing and fitting of which the greatest thought and care are being exercised. The second class passengers, 94 in number, are accommodated aft, and they, in addition to the usual staterooms, have dining saloon, smoking room, lounge, etc., etc., the fittings of which will compare very favorably with those of the first class in most liners. The third class, 70 in number, are berthed forward, and they have, in addition to the usual living rooms, a good dining saloon on deck.

The vessel will be rigged as a two-masted schooner, and the equipment of machinery for maneuvering her, handling cargo, etc., will include eight electric winches in addition to the usual steam steering gear controlled by telemotor, capstans, windlass, etc. She is also to be fitted with an installation of wireless telegraphy.

For service in the Mediterranean, it is needless to say that the ventilation has been the subject of much care and consideration. Electricity is largely used on board, not only for lighting the vessel throughout, but also for ventilating the various rooms by means of fans, for extra heating of some of the most elaborate rooms by electric fires, and for working some of the deck machinery. There is also steam heating throughout.

Altogether the vessel will be one that is likely to uphold the credit of the Tyne in general and her builders, Swan, Hunter & Wigham Richardson, Ltd., in particular.

IS A LANDING STAGE A VESSEL?

Is a landing stage a vessel? It would seem as though the answer were obvious, but apparently it has been necessary for five lord justices of England to declare that a landing stage is not a vessel. The case was an appeal from an order made by Justice Bargrave Deane in admiralty in the action of the Mersey docks and harbor board against the steamer Craighall for damages sustained by the steamer striking the Woodside landing stage in the river Mersey. The court held that a landing stage had none of the characteristics of a vessel and could not possibly be included within the term of "vessel." The question of limitation of liability was involved.

The Grand Trunk Pacific railroad now building across Canada to Prince Rupert, B. C., has acquired the site of the flyer dock at the foot of Marion street, Seattle, on which property a large passenger and freight pier will be erected in the near future. The new dock will be 700 ft. in length, extending to the outer harbor line. In appointments it is said it will excel the Colman dock, which for over a year, since its completion, has been considered the finest pier on the Pacific coast.

NAVAL HISTORY SOCIETY.

Rear Admiral C. F. Goodrich is the prime mover in the organization of the Naval History Society upon lines somewhat similar to the Navy Records Society, of England, which has done so much to preserve the records of England's naval achievement and to incite public interest in its development. It is the theory of Admiral Goodrich that there is much literature of an invaluable kind to be gathered concerning American naval history on both coast and lake towns, all of it now lying neglected and forgotten in the form of private letters and log books in attics and other unconsidered places. It is to resume this precious material that Admiral Goodrich is urging the formation of the Naval History Society. The circular, regarding the proposed society, reads:

"The absence has long been regretted by the student of our early history of some instrumentality by which to collect, care for, calatogue and make available, the vast amount of material bearing on the growth of the American merchant marine and the creation and development of the American navy, material which, in the form of old letters, journals, log books and souvenirs of travel or adventure, now lies buried in garrets and store rooms or elsewhere held privately and so practically lost to the world. In many cases, the owners would be glad to place such records in responsible hands for preservation. It may be truthfully stated that a reasonably full knowledge of our maritime evolution is essential to a right understanding and appreciation of how our fathers founded the nation and carried its name and fame into remote corners of the earth.

"Recently a number of gentlemen interested in this question have organized the Naval History Society. With headquarters in New York, the Society expects to have branches or Corresponding Secretaries in all principal cities of the Union. The ground it purposes covering is exceedingly broad, and is defined in its charter 'to discover, procure and preserve by publication and otherwise whatever may relate to naval history, science and art and the surroundings and experience of seamen in general and those of the United States in particular, etc.' Notwithstanding the popular belief that little remains to be said on this score, those best capable of judging realize that in the latter case only the very beginning of knowledge has been achieved, while the wider theme, that of the sailor in all times, still presents numberless points that demand and deserve elucidation. The aims of this Society ought to appeal to all thoughtful persons and especially to those who take just pride in what their ancestors did on the water, whether as peaceful traders in remote seas, as pioneers in the whaling industry or as defenders of their country in armed vessels, private and public.

"A few names of those identified with it will suffice to show the character of the Society and establish its claim to consideration; such as the Secretary and the Assistant Secretary of the Navy, Admiral Dewey, U. S. N., Capt. John S. Barnes, late U. S. Navy, President of the Society, Mr. Loyall Farragut, U. S. Senator Geo. C. Perkins, Col. R. M. Thompson, Col. W. C. Church, Editor of the *Army and Navy Journal,* Wm. Agnew Paton, Hon. Herbert L. Satterlee, late Assistant Secretary of the Navy, Hon. Chas. H. Allen, late Assistant Secretary of the Navy and Governor of Porto Rico, Mr. Charles Francis Adams, Rear-Admiral Stephen B. Luce, U. S. N., and many other distinguished naval officers.

"The Society needs a permanent endowment and a large membership. Contributors to the former are 'patrons' when giving $1,000; 'benefactors' when giving $5,000 or upwards. With these titles goes membership in perpetuity which can be bestowed by gift or bequest. The fee for life membership is $100; the dues for annual membership are $5.00. Every member will receive, free, a copy of the Society's publications, which will doubtless be valuable and interesting in the extreme.

"Substantial progress has already been made towards an endowment and certain valuable memorabilia have been promised.

"You are cordially invited to join the Society on such footing as you elect, making your cheque payable to the 'Treasurer, Naval History Society,' and remitting to him, Robert W. Neeser, 1076 Chapel street, New Haven, Conn. Mr. Neeser, who is the Secretary as well, will be glad, on request, to supply any further pertinent information.

THE EXECUTIVE COMMITTEE,
The Naval History Society."

A QUARTER'S SHIP BUILDING.

From the returns compiled by Lloyds Register of Shipping, it appears that, excluding warships, there were 386 vessels of 1,057,636 tons gross under construction in the United Kingdom at the close of the quarter ended March 31, 1910. This includes 341 steel steamers of 1,051,667 tons, compared with 337 steel steamers of 902,970 tons in the corresponding period. The tonnage now under construction is about 144,000 tons more than that which was in hand at the end of last quarter, and also exceeds by about the same amount the total building 12 months ago. The figures of the warship tonnage now being built (303,685 tons displacement) are the largest reported since September, 1904.

Of the vessels under construction in the United Kingdom at the end of March, 314 of 734,590 tons are under the supervision of the Surveyors of Lloyds Register with a view to classification by this Society. In addition, 72 vessels of 213,508 tons are building abroad to the society's classification. The total building at the present time under the supervision of Lloyds Register is, thus, 386 vessels of 948,098 tons. Details of this total follow: Building in United Kingdom for home account, for sale, etc., 266, gross tonnage 631,106; ditto for foreign and colonial account, 48, gross tonnage 103,484; building abroad for United Kingdom owners, 4, gross tonnage 1,625; ditto for foreign and colonial account, 68, gross tonnage 211,883; total building on March 31, for classification with Lloyds Register, 386, gross tonnage 948,098.

The statistics showing the amount of work in hand at the principal districts on March 31 show increases in every case except the Barrow and Belfast, which last-named center heads the list with the largest amount of work in hand. The total for Belfast is 233,360 tons, represented by 20 steamers, which compares with 26 steamers of 258,590 tons at the corresponding date of last year. At Glasgow there are under construction 68 steamers of 185,307 tons and 11 sailers of 1,129 tons, against 70 steamers of 177,977 tons and 30 sailers of 6,218 tons; at Newcastle, 51 steamers of 180,468 tons and 5 sailers of 2,450 tons, against 48 steamers of 123,165 tons and 3 sailers of 900 tons; at Greenock, 44 steamers of 154,810 tons and 3 sailers of 40 tons, against 34 steamers of 122,505 tons and 5 sailers of 31[illegible] tons; at Sunderland, 41 steamers of 117,050 tons, compared with 40 steamers of 86,787 tons; at Middlebro' and Stockton, 34 steamers of 62,549 tons, compared with 13 steamers of 41,543 tons and 3 sailers of 916 tons; at Hartlepool and Whitby, 14 steamers of 52,930 tons, compared with 10 steamers of 30,095 tons; at Liverpool, 12 steamers of 35,140 tons, against 14 steamers of 23,588 tons; and at Barrow, Maryport, and Workington, 6 steamers of 2,880 tons, against 6 steamers of 4,500 tons. Of the total of 386 vessels of 1,057,636 tons, 279 of 842,561 tons are building for the United Kingdom, and 17 of 36,788 tons for the colonies. Two vessels of over 20,000 tons each are under construction, and (including these) 12 of over 10,000 tons each. During the

quarter there were launched 126 vessels of 241,805 tons, and 4 sailers of 750 tons.

At the same date there were under construction in the United Kingdom 77 warships of 303,685 tons displacement, including 70 vessels of 257,585 tons for the British Admiralty. The ships for foreign accounts included a battleship of 19,600 tons at Barrow, one of 19,000 tons at Elswick, two scouts of 6,000 tons at Elswick, and three torpedo boat destroyers of 1,800 tons at Scotstoun. In the Admiralty dockyards there were under construction two battleships of 42,400 tons displacements at Portsmouth, two armored cruisers of 39,750 tons at Devonport, two third-class cruisers of 6,700 tons at Pembroke, and four submarines of 1,880 tons at Chatham.

In private yards the work included one battleship, each of 22,500 tons at Dalmuir and Elswick, and one each of 20,000 tons at Greenock and Jarrow, protected cruisers, two each, of 10,050 tons at Barrow, Dalmuir, and Elswick, one each of 4,800 tons at Clydebank and Govan, and one of 5,250 tons at Govan; 40 torpedo destroyers as under: Govan (8), Clydebank (6), Woolston (5), Cowes (5), Hebburn (4), Dumbarton (4), Birkenhead (3), and one each at Blackwall, Govan, Jarrow, Partick and Wallsend, and seven submarines at Barrow.

A NEW GAS POWER TUG.

A large gasoline towboat, designed for ocean service, has just gone into service for the Breakwater Co., which is building a breakwater at Cape May.

The boat, which is named the Natalie, was built by M. M. Davis & Son, of Solomons, Md., from plans by Capt. I. A. Watrous, of the Breakwater Co.

The Natalie is 65 ft. on deck, 18 ft. beam and her least depth of hold is 6 ft. 4 in., with a normal draught of 3½ ft. By means of water ballast, her draught can be increased 12 in.

Her frames are doubled, of sawed oak, 3½ in. by 8 in. and 22 in. centers. The deck beams are 8 x 8 in. spaced 22 in. centers. The keel is of oak, 10 x 12 in.; the keelson is 12 x 12 in. There are four sister keelsons, 8 x 8 in., and bilge stringers, 6 x 10 in. The shelf is 6 x 10 in.

This framing is as heavy as ordinarily employed for a 125-ft. steam tug, but with the Natalie strength is one of the features. She is planked with selected 2½-in. oak and sheathed inside with 3-in. yellow pine. Her deck is of oak and yellow pine laid in strips 3 in. square. All fastenings are of galvanized iron and a large number of bolts are used.

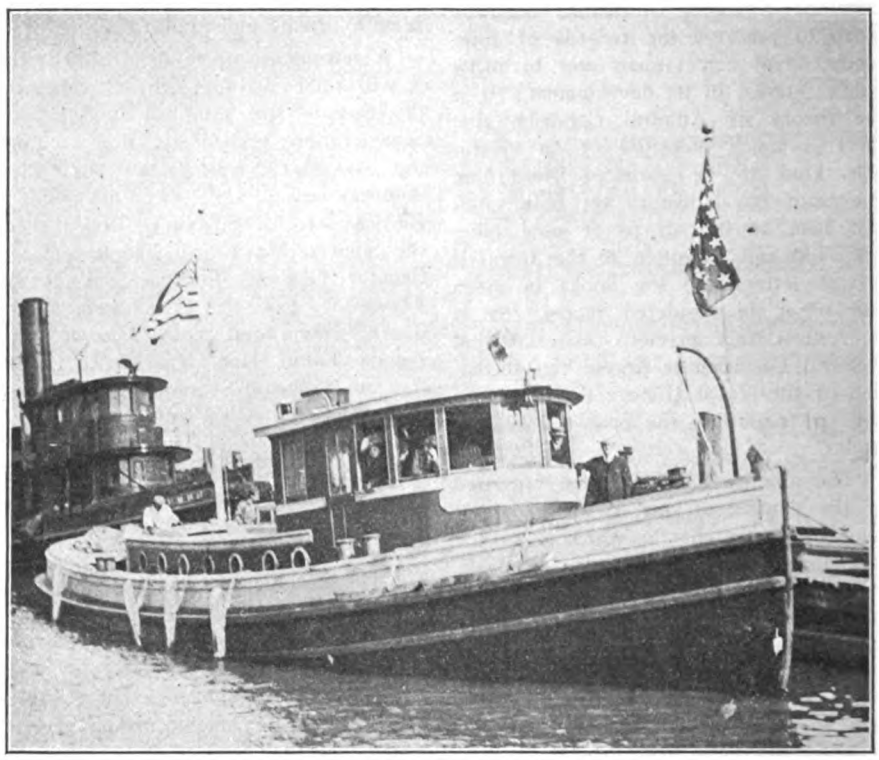
The superstructure is of oak and pine and the deck house is divided into three staterooms, a combination galley and mess room, two large storerooms for hawsers, etc., and a toilet room.

Fresh water tanks with a total capacity of 15,000 gal. are fitted forward and aft, in which water will be carried for supplying the steam derricks employed on the breakwater or for ballast. The gasoline tank, which is of No. 12 copper, with a capacity of 600 gals., is stowed forward. It rests in a galvanized pan, having an outboard drip and with a vent pipe extending to the top of the pilot house.

The main engine is of 125-H. P., of the four-cycle, reversible, Standard type, giving a speed of 12 miles per hour. An 8-H. P. Standard engine is connected to a 4½-K. W. 110-volt generator for electric lighting, including cabin, deck and running lights and a 9-in. searchlight, and current to two electric motors, one of which is for operating a 4-in. wrecking pump, equipped with 25 ft. of suction hose of a corresponding size. This pump can also be utilized for operating four lines of 2-in. fire hose, taking the supply from the sea or from the storage tanks, or for transfering fresh water to other vessels or shift it from the forward to the after tank or vice versa.

The other motor referred to is used to operate a gypsy windlass on the after deck, a convenience fitted on comparatively few of the large steam tugs, but since the crew of the Natalie will have to handle 8-in. hawsers the power windlass is deemed a necessity. An extra large double bitt and windlass is fitted forward while on each side of the deckhouse are fitted heavy iron bitts.

The electric plant engine also operates an air pump for supplying compressed air for the 3½-in. whistle.



GAS POWER TUG NATALIE.

The ground tackle consists of two patent anchors of 500 and 300 lbs., respectively. In other respects, the general equipment of the Natalie is about the same as is found upon the average sea-going towboat.

The work that the Natalie will do will be to handle 150-ft. barges laden with stone, etc., for the construction work on the new breakwater. While it will be deep sea towing for several miles, the roughest part of the work will be in towing the barges into the shoal water in heavy weather. It is expected that she will frequently ground on the bar and that on occasions she will have to go through the breakers. She has been built especially to withstand strains of all kinds and she will do work that two steam tugs formerly did until they were both lost on the bar.

The Skinner Shipbuilding Co., Baltimore, Md., launched the tug Lynn Haven for the Norfolk & Southern railroad last month.

The Chesapeake Steamship Co., Baltimore, Md., are to build two passenger and freight steamers, 310 ft. long and 60 ft. over guards.

In Behalf of Our Merchant Marine

B. N. BAKER, president of the Shipping League of Baltimore, delivered an address at the Navy League Convention at the Bellevue-Stratford hotel, Philadelphia, on April 8, on the necessity of upbuilding the American merchant marine. Mr. Baker was formerly president of the Atlantic Transport Line and no man in the country is better qualified to speak on the merchant marine. He related a number of important events in connection with the Spanish-American war. He said:

I thank you for the privilege of addressing this distinguished audience. The honor would be overwhelming did I not realize that you desire the experience of a practical worker brought into the discussion of a question that must be solved along practical lines and that means so much to the welfare of our nation. Personally I wish an orator stood in my place to deliver a message that would kindle your zeal and send you forth to stir our people to an understanding of what it means for a government to dream great dreams without providing the means for future safety. If history teaches one thing, it is that what has happened may happen again. And the extraordinary fact in our country is that a lesson of only yesterday seems to have been forgotten by the men who are directing our national affairs. Events have launched America in the turbulent sea of world politics. As it develops we can not escape this destiny, and we shall have only ourselves to blame if at any point in the game we are not prepared to back up with men and ships the diplomacy and ambitions of our statesmen. It is all very well to plant the flag thousands of miles from our coast line; but beautiful as it undoubtedly is, the Star Spangled Banner will be rather lonesome on an island unless it also floats on good boats along the ocean highways. I fear we forget that a dozen years ago, when we went to war with Spain, we were ridiculously unprepared, and I fear that our people do not understand that if we were to have trouble today with a first class power we should be relatively worse off than we were in those uncertain days of 1898.

So, as throwing a strong side light on a great national duty, I am invited to put before you not the eloquence of the orator, but the plain narrative of an old steamship man who was called in at a critical juncture of the nation's history to aid the national authorities in providing ships for both the army and the navy. Naturally, I must quote largely from memory, but most of the data is in official form and I shall keep well within the facts.

The Getting of Transports.

At the beginning of the Spanish-American war, Senator Gorman, one of our senators from Maryland, sent for me and said that he was acting on behalf of President McKinley, who wished me to call at once. I did so, and had a long interview with the President. In this talk, President McKinley outlined fully the difficulties under which the War Department had to contend in providing necessary transport facilities for use in the conflict then pending with Spain. He asked me to co-operate and to do all I could to help the government. His request was a command. It came so suddenly that the answer puzzled me greatly. But I gave up all other connections and engagements and devoted myself to the problem as best I could. At that time I was president of the Atlantic Transport Line. We had a very large number of ships, and some of them were particularly suited for government transports. These ships while owned by American interests were under the British flag. They were registered at Somerset House, London. The difficult point was to get control of them so that I could transfer them to the United States. It was necessary to have an Englishman as Ship's Husband. The senior of our London firm, A. S. Williams, held that position. You can easily understand that to transfer these ships from the English to the American flag for use by our government was a serious matter. I sought the best legal advice and these gentlemen decided it was impossible to accomplish what I wished. However, the suggestion was finally made by me that if Alfred S. Williams as the Ship's Husband in England would consent to the transfer of these ships to me personally, I might transfer them to the United States government. There was a great deal of consultation and in the end Mr. Williams agreed to assume his share of the responsibility, although if difficulties had arisen, he would have been subject to British laws. What the penalties were at the time, he did not stop to consider.

Transferring Seven Ships.

Our plans were laid before Mr. Griggs, the attorney-general in President McKinley's cabinet. He decided that if Mr. Williams and I agreed to take the risk, he thought it might be done. Then we went to the Secretary of War and an agreement was duly made for the transfer of seven large ships to the United States government upon this plan. I am particularly proud of that transaction. The contract for these seven ships covered just nine lines, written by me on the Arlington hotel company note paper and accepted across the face of the Secretary of War. It required the immediate transfer of the seven ships for the sum of $4,000,000. No transaction ever made by the United States government was more profitable to it. Nor do I believe that the same results can be shown in any government contract ever made. For, after the use of these seven ships for an entire year by the government, the War Department was offered $100,000 more than the purchase price, thus being able after the free use of the ship for 12 months to turn them over at a profit. It has been a pleasure to preserve all the documents of this transaction.

The Hospital Ship Missouri.

You may be interested in one or two instances that happened in connection with the transfer of these ships, and the conditions existing at the time of the Spanish-American war. Having many occasions to visit the War Department, I was requested by Surgeon-General Sternburg to see if the Secretary of War would not arrange to make some provision for bringing the sick and wounded men from Cuba. He said he felt sure there would be a great deal of sickness especially on account of the troops not being acclimated. I recall how deeply his argument impressed me. I put it before the Secretary of War and said I thought he should provide a hospital ship. He replied that it would be time enough to consider that after he had secured the means for transporting the troops to Cuba. I returned to the Surgeon-General's office and informed him of the position taken by the Secretary of War. The Surgeon-General remarked that he was afraid the country would criticise him for not taking steps to provide for the return of the sick and wounded from Cuba. He expressed his disappointment so eloquently and I was so much impressed by his earnestness and his consideration for the care of the men that I told him I would give him a ship and would let him have the choice of four steamers. He accepted the Missouri, and the record of this ship is one in which our country may take real pride, for it saved lives and helped accomplish untold good in alleviating human suffering.

The Blockade of Santiago.

Another incident may interest you as showing the necessity of being prepared for emergency. When Cervera's fleet

entered Santiago, there were many transports just outside the harbor loaded with supplies for the troops who were back of Santiago and in that section of Cuba. The War Department had planned to have these transports enter the harbor of Santiago and from there make a distribution of the supplies. One Saturday evening, I received a summons from the Secretary of War, and when we met, he made this statement: 'Mr. Baker, can you help us out? We have outside of Santiago a large number of transports loaded with supplies and provisions for our troops, and the only possible means we have of landing these cargoes is by taking the flour, provisions and the other things ashore in small boats, and then having them carried on the backs of the men to the soldiers and the refugees who have joined them. While Cervera's fleet is in Santiago harbor, it is impossible for us to supply one-tenth of our men. What are we to do?'

In reply to the question as to what had been done, the Secretary stated that some tug boats and barges had been sent out for the purpose of landing supplies on the south coast of Cuba and that they had been wrecked on Hamilton Bay. He pictured the conditions as most serious and declared that something must be done immediately. I remained in the War Department all night and nearly all day Sunday arranging to secure tug boats. I cabled our London office that I would seize a British ship I found nearly loaded with large timber in Savannah, and I told our London representatives to see the owners and let them know that they would be reimbursed on a liberal scale for the seizure of the ship and cargo. While these arrangements were going on amidst the great strain and excitement, word came that on Sunday, Cervera had come out and had been attacked and that the harbor was free for our transports to enter. I always shall believe there is something in what we old seafaring men believe in, that "There is a little cherub who sits aloft and watches over the life of poor Jack." Surely in this crisis fortune came to us most unexpectedly and in bountiful measure. But the incident was another illustration showing out unpreparedness at that time.

The Spanish Torpedo Boat Ornuz.

Still another incident may be told. The United States government had arranged for auxiliary cruisers for the Navy Department and had chartered the boats of the American Line. I happened to be in London at the time of the sailing of one of these ships—the St. Paul, I think—from Southampton. The immediate return of the St. Paul had been cabled for. At the moment lying in the dock at Cork Harbor was the torpedo boat Ornuz, belonging to the Spanish government. With hurry orders the American Line ship was rushing with all possible speed to complete arrangements to leave Southampton that Sunday morning. She had arrived there only the day before. I know of my own personal knowledge that it was the plan for the Ornuz to leave the dry dock at Cork Harbor and intercept this ship. Our naval attache in London at that time knew of the circumstances. In some mysterious way on Sunday afternoon the stays supporting the Ornuz in the dry dock at Cork slipped and the torpedo boat went over on her side with such serious results that it was impossible for her to leave. I have every reason to believe that the so-called accident was not an accident.

Surely in our war with Spain we realized what a frightful mistake it was not to have as auxiliary to our navy a merchant marine which could be called upon to relieve the government's necessities. Nothing was ever more manifest. The whole country rang with the cry. Our public men were seized with panic at the folly of our policy.

And yet because our victory was easy and because the strain was for a few months only and because we move so quickly and are so apt to forget, we stand today as unwise children who have learned a great lesson without profiting by it. Is it desirable and is it necessary to have a merchant marine as an auxiliary to our navy? Ladies and gentlemen, I do not need to put such a question to this audience of men who know. By great good fortune we have not had a contest with a first class naval power. We have gone into the politics of the world with superb confidence in ourselves, and with the childish belief that our responsibility does not take with it the imperative need of being prepared with means to back our words. The other day enlightened statesmanship sent the great American fleet around the world. It was a big idea splendidly carried out, and that matchless procession made a great impression wherever it was seen. But how it humbles our pride and makes solemn our thoughts when we know that this fleet could not have made the journey unless it had used the ships of other nations as colliers. You know, and I know, that if tomorrow trouble should come, our navy, excellent as it is, would be comparatively helpless because it would not have the necessary boats back of it to provide its coal and its ammunition and to take care of its cripples. It is all very well to say that it would be easy for us to secure such ships as we might want, but, ladies and gentlemen, let me tell you from my own experience that it would not be easy. Twelve years ago had we not been in direct touch with the foreign office at London, and had Spain entered any formal protest to the transfer of the ships, it would have been impossible for us to have gotten these boats for use in the Spanish-American war. I say this of my own personal knowledge and experience at that time. In fact, it was with a great deal of hesitation and only through the influence of personal friends in London that the foreign office at that time did not object to the transfer; that, too, in spite of the fact that they had received no formal protest from Spain.

The Navy Needs the Merchant Marine.

Where would the United States be if it were drawn into such a conflict as England had with South Africa? Why, all the steamships on the Atlantic coast would be nothing compared with the enormous service which England established for South Africa. This also I know from actual experience, because we chartered many ships to them at that time. Under similar conditions the United States would be entirely helpless. Now, no one is more of a peace man than I am, and no one would regret more than I to see our country drawn into a contest with a great maritime nation, and my purpose here tonight is to emphasize my belief that there is no better way of preventing that sort of thing than to be prepared for it. Our great writers have covered the question fully, and I should like to quote from the most eminent of them all, Capt. A. D. Mahan:

"Can this navy be had without restoring the merchant shipping? It is doubtful. History has proved that such a purely military sea power can be built up by a despot, as was done by Louis XIV; but though so fair seeming, experience showed that his navy was like a growth which, having no root, soon withers away. But in a representative government any military expenditure must have a strongly represented interest behind it, convinced of its necessity. How such a merchant shipping should be built up, whether by subsidies or free trade, by constant administration of tonics or by free movement in the open air, is not a military, but an economical question.

I would also like to quote President Hadley, of Yale College:

"Of England's mail contract system it may be fairly said: (1) That its aims are political and not commercial. It is a necessity for England to have constant communication with her colonies and she has spent large sums for this object. It is almost equally important for her to have an efficient naval reserve and transport service, and she has made her mail contracts one among several means to-

ward this end. (2) That the incidental commercial advantage to the subsidized companies has not been generally great except at a very early period of the system. This is evidenced by the fact that rival unsubsidized lines have been equally successful and that the largest contracts have been on terms which made them a matter of indifference to the party receiving them."

Carrying Our Coal in Time of War.

How are we going to carry our coal supply in time of war? How are we going to provide men for our naval ships if we have no merchant marine to train them? How are we going to provide auxiliary dispatch boats of fast speed? If we were transferring a large force of troops to any foreign country, the miserable old ships we have available for the purpose now would regulate the whole movement, because you must remember that the slowest ship sets the speed. Just think what that would mean in comparison with the facilities provided by the merchant marine of England, Germany, or Japan. Isn't it incredible that with such facts plainly before us we should be doing nothing to correct our most lamentable weakness as a nation and as a business people?

I confess I cannot understand the political sentiment which seems to count as a public enemy a man who advocates the assistance of the government in building up a merchant marine which the government needs so keenly. I cannot understand why the motives of men who love their country and who are thinking of tomorrow should be open to such abuse and misconstruction. But for one, while I hope I am as sensitive as most people, I shall, as an American, say all and do all I can to drive home the truth and to keep before my country this great question of putting the flag on the highways of the world.

A Most Amazing Situation.

I told you about the Spanish-American war. Today, Spain has arranged for a line of steamers via the Panama canal and is advertising for the best terms. The country we fought and whose navy we sought to destroy has seen the possibilities to which our own people seem to be blind, of the great work we are building on the Isthmus. What are we doing? We are spending half a billion dollars on the greatest project of the country, and we are doing absolutely nothing to provide a merchant marine to use the new facilities. It is the most amazing situation any civilized people ever faced. Why is it? How do you account for it? Prior to the civil war the southern democrats were enthusiastic for the merchant marine and were willing to lend generous assistance to it. Today they draw political lines and fight the building up of the merchant marine by mail contracts. It ought not to be a party question. No part of the country should be more interested in it than all the south. The stakes are tremendous, and the way is plain, and in the *North American Review* for January of this year I outlined how it can be done. It would require but little addition to our present law. And in spite of all the outcry made by a part of the press as to looting the treasury and other absurd preposterous charges, it would not take one dollar more than the amount actually received in carrying our foreign mails. In fact, it is practically limited to the profit on our foreign mail business, and thus under wise legislation we should be able to build up superb fleets of modern boats without a penny of cost to the taxpayers of the country.

A great American has said that the hardest thing to get done is that which everybody admits ought to be done. Perhaps it is this fact which has kept us from doing our duty in providing a merchant marine. But in the name of all that is wise and prudent and patriotic, let us no longer postpone the work, but let us, as good citizens and loyal Americans, who realize the duties and responsibilities of the future, go out from this presence tonight enbued with the spirit of progress and of achievement and determined that the American flag shall be fitly represented in the commerce of the world.

THE MANATEE.

The twin screw mail and passenger vessel Manatee has been built by Messrs. J. S. White & Co., Ltd., for the mail and passenger service of the government of Southern Nigeria to the design and specifications and under the superintendence of Messrs. Ridsdale, Wells & Kemp, consulting and inspecting naval architects and marine engineers to the crown agents for the Colonies. The Manatee is 100 ft. long, 16 ft. beam and 4 ft. 6 in. draught; has trimming tank and mail-room forward, and large saloon space for government officers and first class passengers, 25 ft. 6 in. long, with entrance lobby and pantry at after end; and a promenade deck, on which is the steering position and leadsman's platform, over the saloon.

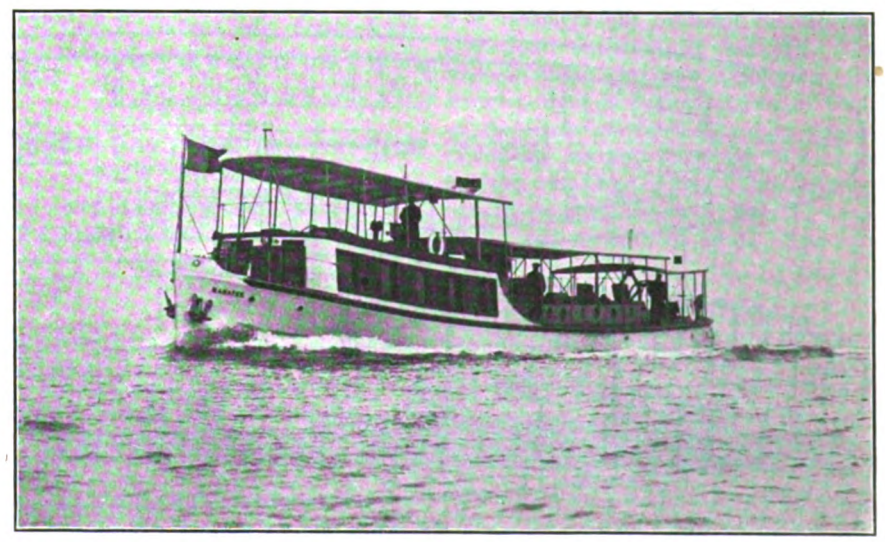
The cargo hold, to take 15 tons, is forward of engine room; and aft a cabin for native clerks on port side, and for engineers on starboard side, with large crew space full width of vessel aft of these.

At extreme after end are European and native galleys, native baggage space, ship's store and native latrine. Second and third class passengers carried aft of cargo hold. Three sundecks are fitted.

The machinery consists of two sets of Kromhout paraffine engines driving twin screws, engines and connections being specially modified and arranged to suit the conditions of the service in the estuaries and on the coast.

Compressed air starting gear is fitted, air compressors being fitted to each engine. The vessel is lighted throughout by electric light, the dynamo in engine room being driven by a Seal paraffine engine. A pumping set by the same makers is also fitted with suctions to all main compartments and to trimming tank.

The engine room is of large size with a view to accessibility to all parts of engines and good ventilation; the latter being secured by large skylights and cowls, and Stone's pivoted side lights



THE MANATEE.

in casings both of engine room and after cabins designed specially for this vessel.

The vessel is provided with large fresh water and oil tanks, the latter of a capacity to enable the vessel to run 900 miles at full power.

On her trials this vessel attained a speed of 12½ miles per hour, and during a special trial made in bad weather has proved herself to be a very good sea boat with excellent maneuvering qualities. Owing to the construction adopted, the absence of the vibration usually associated with motor propelled vessels was a most noticeable feature.

The Manatee has proceeded to her destination under her own power, and is the first motor engined vessel built in England to make an ocean passage.

New Steel Steamer Comanche

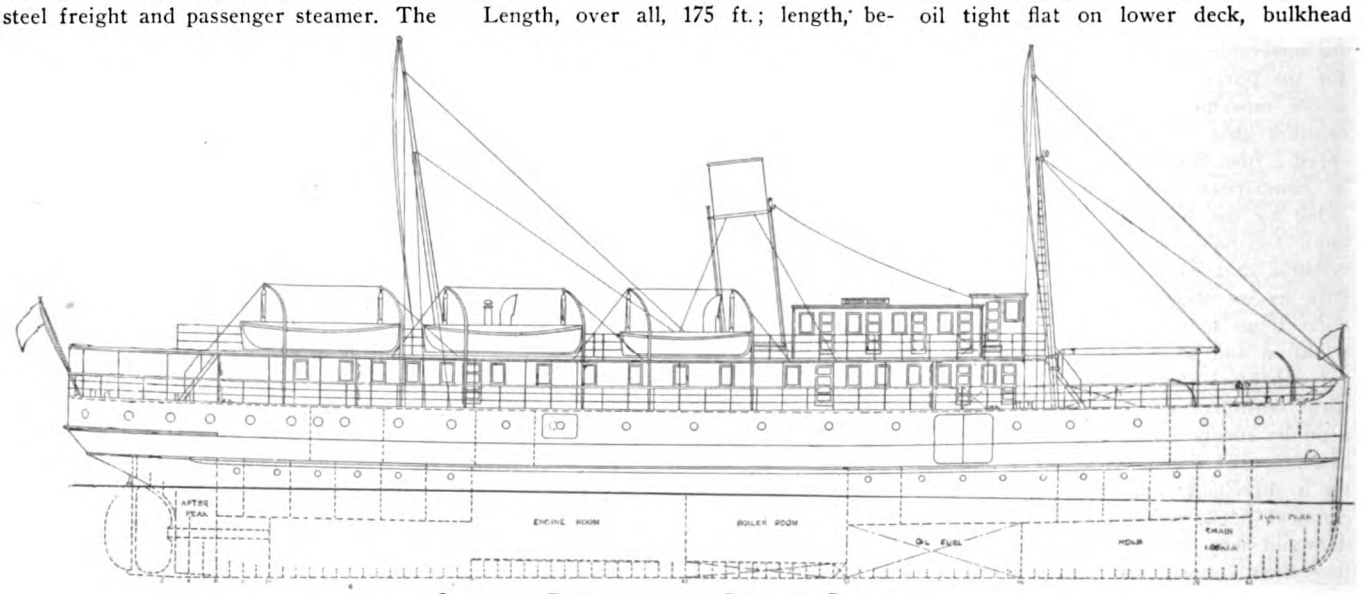
TO accommodate the growing traffic between Seattle and lower Puget Sound ports, the Puget Sound Navigation Co. recently decided to build a new steel freight and passenger steamer. The order for the construction of the new steamer, which will be named Comanche, was given to The Moran Co., of Seattle, who commenced work in February, and expect to have the steamer in operation early in the summer.

The outboard profile and main and upper deck plans are shown in the accompanying drawings. Comanche will register approximately 800 gross tons. Her principal dimensions are as follows:

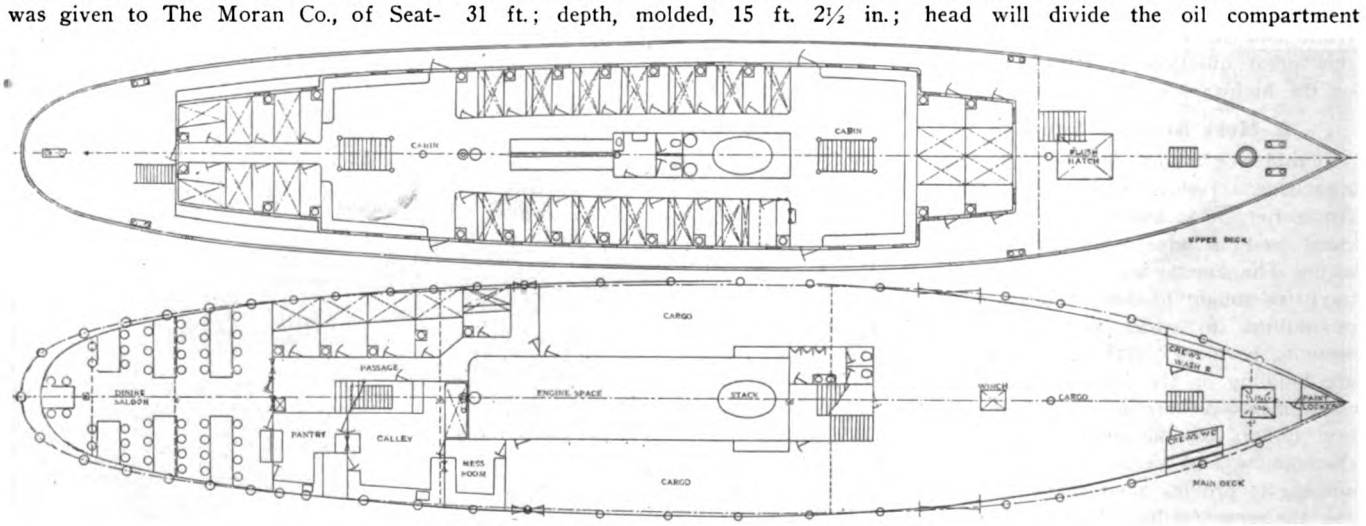
Length, over all, 175 ft.; length, between perpendiculars, 165 ft.; breadth over guards, 33 ft. 9 in.; beam, molded, 31 ft.; depth, molded, 15 ft. 2½ in.; depth of hold, 13 ft. 8 in.; draught, mean load, 11 ft. 6 in.

She is designed for a dead weight capacity of 320 net tons on her mean load draught, which capacity includes all stores, fuel oil, fresh water, passengers, crew, baggage, furnishings and cargo.

There will be a double bottom and a deep tank forward of the boilers for fuel oil. There are three decks, lower, main and upper. The frames and side plating are carried to the upper deck, which is wood. The deckhouse, pilot house, and texas are wood. There are five watertight bulkheads. The oil compartment bulkhead will extend from the keel to the lower deck and the bulkhead forward of the boiler room is to be oil tight to the lower deck. The oil compartment will be formed by the shell plating to the lower deck, a steel, oil tight flat on lower deck, bulkhead forward of boiler room and oil bulkhead in forehold. A longitudinal bulkhead will divide the oil compartment close to the center line of the vessel. The capacity of the oil tanks is 25,200 gals., or sufficient for four days' steaming. A fresh feed water compartment, with a capacity of 21 tons, will be pro-



OUTBOARD PROFILE OF THE STEAMER COMANCHE.



DECK PLANS OF THE STEAMER COMANCHE.

vided in the double bottom under the boilers.

There will be accommodations for 100 passengers in 29 two-berth and 11 three-berth rooms. There are two cabins on the upper deck, one forward and one aft, as shown in the plans. The cabins are connected by a corridor into which the upper deck state rooms open.

The galley and dining saloon seating 44 persons are on the main deck aft. The cargo space is confined to the main deck forward, and amidships on either side of the machinery hatch.

Steam will be furnished by two Roberts water tube boilers having a total heating surface of 5,000 sq. ft., and working under 250 lbs. pressure.

Single screw triple expansion main engines have been designed and built by the Moran Co. The cylinders are 17, 28 and 47½ in. in diameter with a stroke of 36 in. At 90 R. P. M. and 250 lbs. boiler pressure the engines are expected to indicate 800 H. P.

A 12-K. W. electric light outfit and the usual equipment of cargo winches, anchor windlass, steam steering gear, etc., will be supplied, including a surface condenser fitted with independent air pump and independent circulating pump, designed and built by the Moran Co.

The hull and machinery, except boilers and minor auxiliaries, as stated above, were designed and are being built by the Moran Co., of Seattle. The Puget Sound Navigation Co., however, is responsible for the general arrangements.

SUB-SURFACE TORPEDO BOAT.

A new type of war vessel, provided for by Congress in the Naval Appropriation Act of last year, will be officially tested by the United States government at Boston shortly. It is known as the Subsurface Torpedo Boat, and is designed to be immune from the small gun fire, now relied upon as a protection against ordinary torpedo boats. It consists of a submarine hull, which contains all the machinery and torpedo armament, suspended from an unsinkable surface hull divided into compartments packed with cellulose.

Last year's law authorizes the purchase of this boat, when the official trial shows that it fills requirements, and the construction under contract of two others of the same type. The boat has had a preliminary trial; Tams, Lemoine & Crane, the consulting architects, report that it easily made 18 knots an hour, thus exceeding the required speed by 2 knots.

Six tons is the weight of the vessel, and its length is 46 ft. The price which the government has agreed to pay is $22,500. The small subsurface boats can be used either for coast defense, or they can be carried on board of the larger vessels in an armored fleet. In time of action they can be launched and directed, by day or night, against the enemy's fleet, particularly for operations against ships lying under the protection of land fortifications or mine fields, where expensive battleships should not be risked, as at Manila, Santiago and Port Arthur.

In the submarine hull of the new style boat is an eight-cylinder gasoline engine, of 150 H. P. The explosive charge carried for use on hostile vessels is 1,000 lb. of gun cotton. A heavily armored conning tower on the surface hull, communicating with the submarine hull, enables the navigator to direct and control the boat's movements. Only two men are required on board.

It is estimated that a fleet of 50 of these subsurface torpedo boats will cost about as much as two or three destroyers or submarines. As their "cruising radius" is 200 miles, their principal function will probably be for the defense of ports and unguarded coast line.

The subsurface boat is to be operated in one of two ways. Either it may be steered within a short torpedo range and aimed at its objective, the crew leaving it in life boats or buoys, or it may be fitted with a submerged bow torpedo tube to discharge the ordinary 18-in. torpedo.

The total government appropriation for boats of this type is $445,000. When the first is approved, the navy department is authorized to contract for two others, one more of the same size and one larger and faster—a $400,000 "subsurface seagoing destroyer."

The inventor of the new war vessel is Clarence L. Burger, who received the degree of civil engineer from Princeton in 1885.

FRENCH BATTLESHIPS OF THE NEW PROGRAM.

An interesting article by M. Laubeuf in the French journal *Le Yacht* contains the following particulars of the new French battleships, the construction of which is about to be sanctioned by the French Parliament: Length B. P., 540 ft.; maximum breadth at the water line, 88.5 ft.; maximum draught aft, 29.5 ft.; total displacement loaded, 23,100 tons.

The disposition of the armament and armor will be seen from Fig. 1. The armament consists of twelve 12.2-in. guns placed in six turrets (two at each end on the center line and one at each side, the end turrets being placed at different elevations); twenty-two 5.6-in. guns, of which 18 are placed in the central citadel and four aft; eight 1.9-in. guns on the spar deck; and four under-water torpedo tubes. The main armor belt extends all fore and aft, having a thickness of 10.8 in. amidships and 7.2 in. at the ends. In addition, there is a central citadel having armored sides and ends 7.2 in. thick, protecting the base of the turrets, the funnels, the conning tower, and 18 of the 5.6-in. guns. There are two protective decks, the upper being 2 in. thick and the lower 2¾ in. The propelling engines are to be turbines, of 28,000 H. P., driving four screws and capable of giving a speed of 20 knots. The boilers are to be Belleville or Niclausse, with three funnels. The normal quantity of coal is to be 900 tons, but the bunkers will have a capacity of 2,700 tons.

DOVER-OSTEND STEAMBOAT SERVICE.

The Belgian government, in order to maintain the fleet of mail steamers running between Ostend and Dover in the front rank of high-speed channel mail boats, have recently had two new turbine steamers put in hand by the Societe John Cockerill, of Antwerp. The first of these two new boats, the Jan Breydel, went through a course of trials on the Clyde on April 12, when she attained an average speed of 24.9 knots on the measured mile. This steamer has an over all length of 361 ft., beam 40 ft., and a depth of 23 ft. The ma-

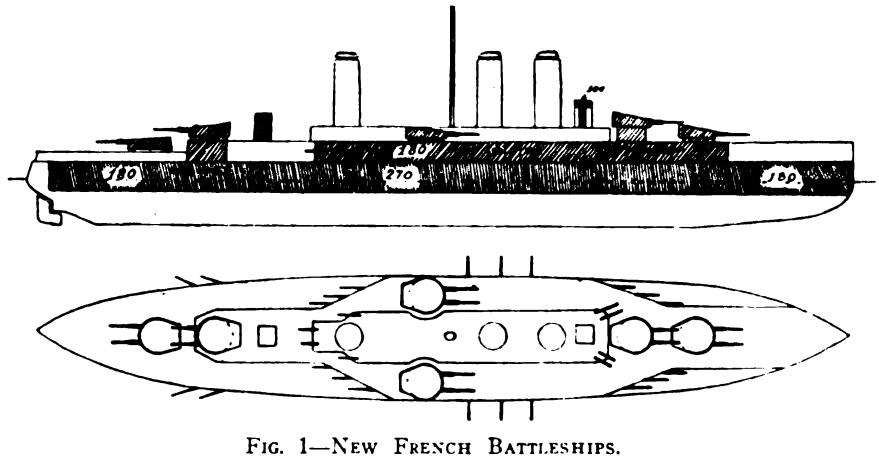
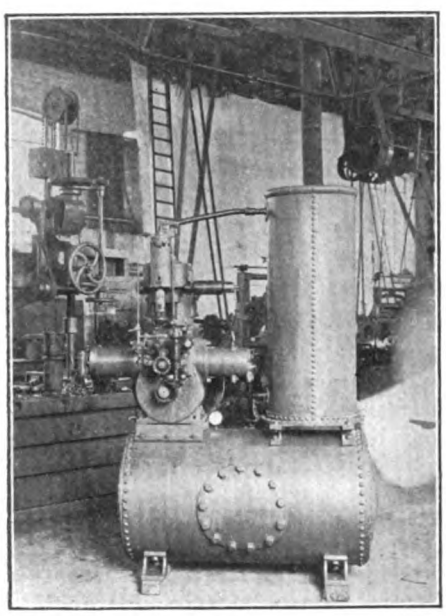


FIG. 1—NEW FRENCH BATTLESHIPS.

chinery consists of one high pressure and two low pressure turbines on the Parsons' system, each driving its own line of shafting and propeller. The boilers, eight in number, are of the Scotch type, and worked under Howden's forced draught. The vessel is now returning to Antwerp, and will be shortly placed upon the line, to be worked in conjunction with the turbine steamer Princesse Elizabeth, already so well known on this service, and the Pieter de Coninck, the second of the new steamers, which will soon undergo her trials.

NEW TYPE OF CRUDE OIL ENGINE.

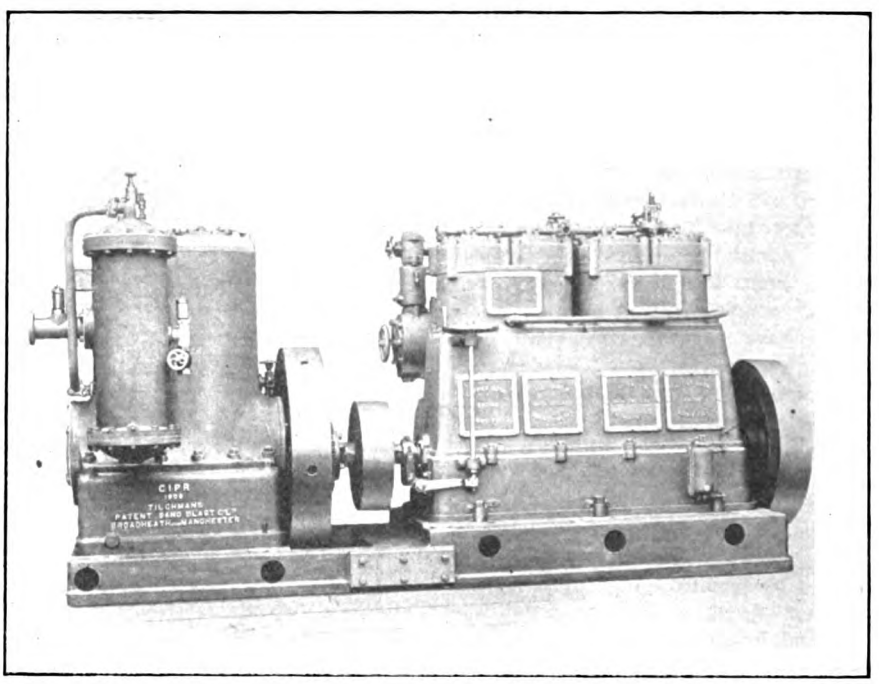
We have been favored by the Griffin Engineering Co., Ltd., of Kingston Iron Works, Bath, Eng., with the accompanying photographs showing



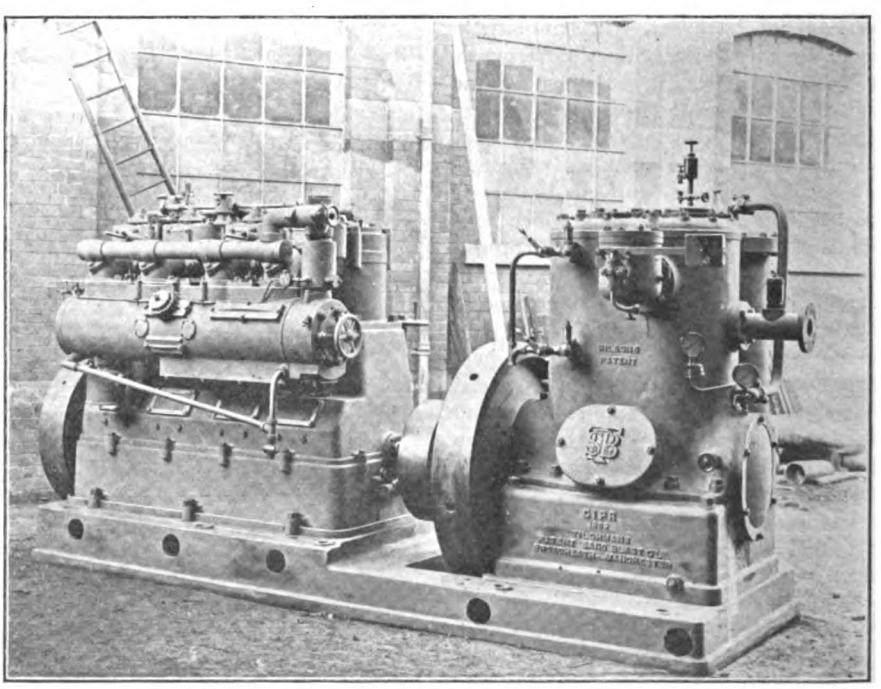
VIEW STARTING ENGINE AND COMPRESSOR OF FOUR-CYLINDER OIL ENGINE.

the principal features of a crude oil engine of an entirely new type, recently constructed and supplied to the order of the Great Indian Peninsular Railway Co., and which is coupled direct to a high-speed air-compressor supplied by the Tilghman Sand Blast Co., of Manchester. Mr. Griffin, the head of the engineering company bearing his name, was responsible for much pioneering work in the adaptation of the internal-combustion engine for use with crude oil as the working fuel. He was one of the first to appreciate the advantages of an addition of water to the charge, for the purposes of moderating the enormous pressures which are liable to be developed when crude oil is adopted as the working agent. In this new engine, however, this addition of water to the charge is dispensed with, the shock on ignition of the charge being kept down by suitably timing the ignition. Where water is added to the charge, the amount required is commonly at least two-thirds of the oil supply. This water is, moreover, not readily available in all cases. In marine work, for instance, it must be carried on board, as salt water cannot be used with safety. In any case the addition of water complicates to some extent the arrangements necessary for preparing the charge.

As will be seen, the engine is of the four-cylinder enclosed type, and it is rated at 70 brake horsepower. The oil fuel used is what is known as "refuse distillate," having a specific gravity of 0.9, and a flash point of 120 degrees Fahr. This oil is cheap and abundant, being obtainable in



NEW TYPE OF FOUR-CYLINDER OIL ENGINE—BACK VIEW.



NEW TYPE OF FOUR-CYLINDER OIL ENGINE—FRONT VIEW.

most large ports at a cost of 5 cents per gallon when purchased in bulk. It has a calorific value of about 19,000 B. Th. U. per lb., and leaves no deposit of any kind in the Griffin engine, the results, it is stated, being in every respect as good as those obtained where refined petroleum is the fuel used. The makers guarantee that the consumption shall not exceed five-eighths of a pint per brake horsepower per hour, equivalent to a cost of less than half a cent per brake horsepower per hour.

The working charge for the engine is passed into a vaporizer, which is essentially the same as fitted to Mr. Griffin's earlier crude-oil engines. It consists of a jacketed cylinder, into which the charge is sprayed by air compressed by a pump driven by the engine itself, whilst the products of combination pass through the jacket. In the present case provision is made for by-passing, at will, some proportion of the exhaust gases direct to the discharge pipe, so that the temperature of the vaporizer can be adjusted to that best suited to the fuel available. The engine is fitted with the new Griffin patent "Cata-Thermic" ignition. It is "timed," an ignition valve being fitted which is opened mechanically and causes the firing of the charge to be delayed until the crank is some distance past its center. This results in eliminating the peak of the diagram, thus getting much the same result as by the addition of water to the charge. As compared with the latter, the makers claim that the new system shows a fuel economy of 15 per cent to 20 per cent. The engine is governed by throttling the charge and not by "hit and miss." Very regular running is thus obtained, making the engine suitable for direct coupling to every kind of high-speed machine. Some details of the ignition and governor gear are for the present reserved, pending the completion of certain foreign patents. The engine is started by means of compressed air, which, in the case of the plant illustrated, is provided by a small combined oil engine and compressor. This engine is of the enclosed type, and is rated at 5 brake horsepower. It drives two air compressors, one furnishing a supply of air at 100 lb. per sq. in. for the starting of the main engine, and the other a supply at 22 lb., which serves to spray the oil used in heating up the vaporizer of the main engine preparatory to a start. The time needed for this process is about 12 minutes, the auxiliary having then stopped. The starting valve, through which the air is admitted to the engine, is fitted to one cylinder only. This valve is held against its seat by an external spring sufficient to resist an air pressure of 100 lb. It is actuated by a lever turning on a spring-mounted fulcrum, and this lever is operated by a cam; when starting up this cam causes the valve to open at the commencement of a power stroke, thus admitting air into the cylinder so long as the pressure inside the latter does not exceed 100 lb. per sq. in. When at length the cylinder draws in and fires a charge, the internal pressure rises above 100 lb. per sq. in., and in consequence the spring-mounted fulcrum of the lever yields instead of the valve opening. Once the engine is fairly under way, the fulcrum is raised by hand so that the lever stands clear of the cam.

It must be added that the engine can be stopped for an hour and a half and then restarted without reheating the vaporizer. This is a feature of some importance, as there is thus no trouble in starting up again after the dinner-hour stop.

NEW BIBBY LINER LEICESTERSHIRE.

The steamship Leicestershire, built by Messrs. Harland & Wolff, Ltd., to the order of Messrs. Bibby Bros. & Co., of Liverpool, for their eastern trade, is now in commission.

The Bibby liners, as is well known, trade between Liverpool, London and Burmah, with intermediate calls in Mediterranean and other ports; and the Leicestershire is, like all the other vessels of the line, a passenger steamer of the highest class. The Bibby line, like other leading steamship companies, is constantly building up and renewing its fleet, and the vessels built at Belfast for these owners always represent the latest achievements in the art of ship building, the general design and some of the special features of the vessel having the personal supervision of Arthur Bibby, the chairman of the line.

It is interesting to recall that the first ships constructed at Messrs. Harland & Wolff's yard about 50 years ago were for this famous line. They were named the Venetian, Cicilian and Syrian, and their yard numbers were respectively Nos. 1, 2 and 3. They were extremely handsome vessels with the old clipper bow, which in later vessels has been discarded for the more utilitarian straight stem.

The Leicestershire is 482 ft. 9 in. long by 54 ft. 4½ in. beam by 35 ft. 6 in. deep, with a gross tonnage of about 8,000 tons. The machinery has also been constructed by Messrs. Harland & Wolff, Ltd., the vessel having two sets of quadruple-expansion engines arranged on the balanced principle. The auxiliary machinery for working the ship and cargo is of the latest design, and the steering gear is on the firm's latest model, embodying the most recent engineering developments in connection with this gear, the importance of which as an element of safety in the ship is generally recognized. In this gear by an arrangement of springs in the quadrant the rudder is relieved of the heavy shocks to which a ship's rudder is liable at sea.

As in the other vessels of the line, the passenger accommodation has received the most careful consideration by owners and builders alike, and in the staterooms and public rooms all the arrangements tend to insure the comfort and enjoyment of the passengers. The ventilation—so important in the trade—has been carefully thought out, and much skill and ingenuity brought to bear in the provision of the most ample ventilation, both natural and mechanical. In this vessel, as in others of the line, a number of the staterooms have been arranged on Arthur Bibby's patent tandem principle, which is a very popular arrangement, doing away with inner rooms, every stateroom in the ship having a port, thus giving natural light and ventilation to all.

The passengers' entrance on the bridge deck is panelled and framed in oak, with dado also in oak, and the ceiling finished white.

The saloon is situated on the upper deck and extends the whole width of the ship. It will seat 181 passengers. The saloon is panelled and framed in oak, richly carved; upholstery moquette, and fittings gold plated. The ceiling is white, and a handsome grand piano is placed at the after end. The sidelights are arranged in pairs both at the sides and at the forward end. The saloon has small rectangular tables, and a well with skylight over the center. This, as also the other rooms, are well supplied with electric fans.

The drawing room is on the boat deck, and is a very luxurious apartment; panelled and framed in satinwood, enriched with carving, with mahogany dado and furniture; ceiling white; upholstery moquette, red Wilton carpet completely covering the floor. Large windows arranged in pairs, with jalousie and stained glass

shutters. The room contains small square tables in bays, writing tables and easy chairs, and a fine mahogany piano. A handsome dome skylight over the center.

The smoke room, on the boat deck, is in oak, relieved with carving; ceiling white; upholstery moquette. The windows are of large size, arranged in pairs, with jalousie and stained glass shutters. Small square tables are arranged in bays, and there is a large skylight over the center of the room.

All these rooms are elegant apartments and well in keeping with the traditions of the line.

A veranda has been arranged adjoining the after end of the smoke room, providing an open air smoking room. This is sure to be a popular part of the vessel. There is a handsome teak balustrade round the after end, with turned newel posts. The general finish of the apartment is in white, and small tables and chairs are arranged on the cafe principle.

The staterooms are arranged on the bridge deck and upper deck. Those on the bridge deck (in three separate houses) are all outside rooms, and those on the upper deck are all arranged on the tandem principle already referred to. The decoration of the staterooms is well in keeping with that of the public rooms—the framing is in white; the furniture mahogany; upholstery moquette; Brussels carpet; and jalousie shutters to windows. The whole of the passenger accommodation is arranged in the central portion of the ship.

The vessel's refrigerating appliances are ample to insure always having a good supply of ice, and for the storing of fresh provisions, fruit, etc. The electric light and other appliances throughout the vessel are complete in every way.

Captain G. H. Harris was in command of the vessel, and Arthur W. Bibby (the chairman of the line) and a party of friends crossed over in the ship.

The Sewell's Point Coal Pier of the Virginian Railway

IN order to secure speed and economy in the trans-shipment of coal in large quantities, the Virginian Railway has recently constructed a modern coal handling pier at its seaboard terminal, located on Hampton Roads, at Sewell's Point, Va.

This pier is 1,045 ft. long from bulkhead to out-shore end, 65 ft. wide, and 76 ft. high at the in-shore end, from which point it slopes to a height of 69 ft. at the out-shore end. Except for the trestle approaches at the in-shore end, which are constructed of timber, the pier is built entirely of heavy structural steel erected on substantial concrete foundations; it has a greater capacity than any other pier on the Atlantic coast, and can deliver 1,500 tons of coal per hour to vessels, or a total of 4,500,000 tons per year of 300 ten-hour working days. This does not represent the limit of its capacity, as it is at present equipped with only one car dumper, which meets the present requirements and handles one 50-ton car every two minutes. The remainder of the pier equipment could readily handle double the present quantity if an additional car dumper were installed. The normal operating output of the pier can be, and occasionally is, augmented by coaling vessels at night. All of the machinery used in handling the coal is electrically operated, and both the pier and terminal yards are lighted by means of arc lamps.

Method of Handling Coal.

The following outline of the methods employed in handling the coal, from the time it leaves the mines until it is received by the collier or steamship, indicates the thorough manner in which the various factors that ordinarily add a large percentage to the first cost of coal have been considered, and shows the economy that has been obtained by providing at the terminal an unusually complete mechanical equipment, which is especially designed for this class of work and which is practically automatic in operation.

The Virginian Railway is primarily a single-track coal transporting road, although some passenger traffic is handled. The road is 442 miles long, and extends inland from Sewell's Point to Deepwater, near Charleston, W. Va., tapping an extensive coal mining region. At Princeton, W. Va., 350 miles from the seaboard, a large gathering yard has been provided where the product of the various mines, located along the main and branch lines, is assembled for shipment to the coast in 80-car trains.

In order to have the cars suitable for carrying return freight, a gondola type of car is used instead of the usual "hopper" coal car, this feature rendered it necessary to provide apparatus for dumping the cars at the terminal pier.

When the trains arrive at the terminal yards at Sewell's Point, the cars are classified and are then run into a gravity yard and dropped one at a time to the foot of an incline, after which they are lifted to the car dumper platform by an electric "mule" or "barney" hoist. Upon arriving on the dumper platform, the car is firmly gripped by huge steel clamping arms; the platform is then tilted sideways and finally turned upside down, with a total turn of 115 degrees, thereby instantly dumping the entire contents of the car into a special steel conveyor car which runs on a track located below the dumper.

When the next loaded car is pulled onto the dumper, it pushes the empty car from the platform, whereupon it travels by gravity into the empty receiving yard, where the service cars are assembled in trains to be returned to the mines. The car dumping process is electrically operated throughout, and is under the control of one man.

The pier is provided with 10 of the special conveyor cars referred to above; these are made of steel with hopper bottoms, and have a carrying capacity of 60 tons each. They are motor-driven and are provided with an air compressor outfit for controlling the brakes and for operating the "hopper" bottoms of the car. An operator's cab is located at each end of the car. Current is received through an overhead trolley system.

The Conveyor Cars.

After receiving the coal at the dumper, the conveyor car travels by its own power over an automatic scale, where it is weighed without being stopped. The cars are all of the same weight, which fact simplifies the weighing of the coal, as the tare weight of the cars is set on the tare beam of the scales, and the automatic weighing machine records only the net weight of the coal in the cars.

After leaving the scale the car runs to the foot of the long incline on the main pier, where it passes over a "barney" pit sunk between the tracks, in which the "barney" car is located. The main hoist starts the "barney" car, which runs from the pit on a narrow gage track laid between the

conveyor car rails. The push bar of the "barney" car comes in contact with the rear coupling of the conveyor car and pushes it up the incline to the deck of the pier. The hoist is then reversed and the "barney" car returns to the pit, ready for the next conveyor car. On arriving at the deck of the pier the conveyor car is switched to one of the two delivery tracks located along the two sides of the pier; and, traveling by its own power, it deposits the coal in the pier hoppers and then returns by gravity on an incline track in the center of the pier to a point near the dumper, when it is ready for the next trip.

Storage Capacity of Pockets.

Along each side of the pier there are located 31 coal pockets, each 25 ft. from center to center. These pockets have a storage capacity of 60 tons each, and are provided with sliding hoppers and chutes for delivering the coal to vessels. The chutes have a vertical range of 43 ft., and a side range of 25 ft. This range of adjustment permits the delivery of coal to the vessels with a minimum amount of breakage, as the difference in elevation of the vessel, caused by the changing tide or by the weight of the cargo, can be counteracted by adjusting the chutes. The slips on each side of the pier are 150 ft. wide and have a depth of 30 ft. below mean low water.

Both the pier and receiving yard are lighted by means of 64 enclosed arc lamps with porcelain enamel reflectors, which provide ample lighting for the operation of the coal handling apparatus at night. Special lighting transformers for the operation of these lamps are provided in the sub-station, which is located in the terminal yards.

The rapidity with which the coal is handled is evident from the fact that if a ship or barge is coaling while the pier is in operation, the coal can be dumped from the service car, weighed, dumped in the pier hoppers, and chuted to the hatchways in less than five minutes.

Situated below the pier at a point where the main incline meets the pier deck is a neat brick and concrete building which incloses the specially designed main hoist, together with the necessary resistance, contactor control panel, and switchboard.

Largest Electrically Operated Hoist.

As this is said to be the largest electrically operated hoist ever constructed, the following data may be of interest:

The hoist, complete with motors, has a weight of 180,000 lbs. and is installed on a bed plate with dimensions of 18 ft. 11 in. by 22 ft. 4 in. All the gears are made of cast steel with cut teeth; the main gear having a diameter of 116 in., a face of 12 in., and teeth of 3½ in. pitch. The main gear, together with the hoist drum, is mounted on the main shaft, which is 12 in. in diameter; the drum having a diameter of 84 in. between flanges. The face of the drum is divided into two sections by a flange, the large section being 42½ in. wide and provided with grooves for the 1¾ in. main hoisting rope. The smaller section is 7 in. wide and grooved for a ¾-in. back haul, or tail rope. The ratio of the gearing between the hoist and the motors is 21:1; an intermediate gear of 72 in. diameter, and a pinion of 21½ in. diameter being used.

For the operation of this hoist two direct current motors are provided; one motor driving the hoist and the other being held as a reserve, which can be put into service instantly, if required. These motors are compound wound and are rated at 550 H. P., 550 volt, 525 R. P. M. They are equipped with commutating poles to insure sparkless commutation; this feature being especially valuable in this installation, due to the heavy intermittent overloads which the motors have to carry while in service. Both motors are mounted on special bases which are bolted to the hoist base, the motors being located on either side of the hoist and connected with it through gearing.

Direct Current Motors.

While these motors are rated at 550 H. P., they are called upon to actually develop 980 H. P. while a conveyor car is being taken up the incline. They have been in operation since April 1, 1909. An incident which gives an idea of the overload capacity of these motors, occurred when the hoist was accidentally started with the hoist brake set. Under these conditions the motor in operation developed 1,250 H. P. without injury.

Located between the two motors and mounted on the hoist base proper is a motor-driven air compressor outfit, similar to those supplied for street railway service. The air pressure developed is 90 lbs. per sq. in., and the supply is used for the operation of the main hoist brake.

The brake is mechanically set on the hoist drum by a 1,400-lb. weight, which is held in the "off" position by compressed air while the hoist is in operation, the air being applied by means of a solenoid actuated valve so connected that the brake is automatically released on the first notch of the hoist controller, and automatically set when the controller is in the "off" position.

Control Equipment.

The control equipment includes a switchboard with switches, circuit breaker and ammeter, heavy contactors mounted on a panel, interlocks, controller resistance and relays, and a master type controller. If the field circuits of the motors should be opened during operation, relays serve to throw the motor off the power circuit by tripping the main circuit breaker; and as the solenoid-operated brake valve is connected so that its circuit is made and broken at the same instant as that of the motors, the brake will be automatically set in case of interruption of the motor circuit.

The contactor panel included in this equipment has a larger current carrying capacity than any other of this type heretofore constructed for hoist service.

It is provided with current limit relays, so that it is impossible for the operator to apply more than a predetermined amount of current to the motor during hoisting, although he has full control of it in all other respects.

Installation of Master Controller.

The master controller is not located in the hoist house, but has been installed in a small operator's cabin opposite the barney car pit, 350 ft. distant from the hoist; by reason of this arrangement the conveyor cars are in full sight of the operator from the time they leave the lower level until they reach the deck of the pier. When a conveyor car reaches a given point near the top of the incline, a limit switch causes a bank of red lamps to light up in the operator's cabin, as a warning to the operator to throw the controller to the "off" position. If, however, for any reason he fails to do this, the limit switch at a given point further on will automatically throw the power off the motor, and thereby set the brakes. It is then impossible for the operator to start the motor in the same direction. The limit switch operates on the down haul in the same way

to insure the safe return of the barney car to the pit.

Importance of the Hoist.

It will be seen from the above that every effort has been made to insure the safe and uninterrupted operation of this hoist, which is the most important piece of apparatus in the pier equipment. In service, the hoist can deliver 45 loaded cars per hour, each car averaging 185,000 lbs. The cars are moved up the incline at the rate of 480 ft. per minute and the barney car returns to the pit at a speed of 555 ft. per minute, the main haul rope unwinding from the drum as the tail rope is wound on. The incline has a 25% grade, and the vertical distance to which the car is elevated is 77 ft. The main haul rope of the hoist is 1¼ in. in diameter, 6 strand, 19 wires. The tail rope is also 6 strand, 19 wires, 1¼ in. in diameter, both ropes being made of plow steel.

The hoist, which was especially designed to meet the requirements of this coal pier, was supplied by the Lidgerwood Mfg. Co., of New York, the motors and electric control apparatus being manufactured by the General Electric Co.

Power is secured from the generating station of the Norfolk and Portsmouth Traction Co., located in Norfolk, Va., and current is transmitted a distance of ten miles to a rotary converter sub-station located in the receiving yard of the railway terminal, from which direct current is supplied to the motors on the pier.

The plans of the Virginian Railway for the Sewell's Point terminal include the construction of three additional piers similar in capacity and equipment to the one described above. When the entire development is completed, the terminal will have a normal annual capacity of 18,000,000 tons, and will constitute the largest coal handling plant of this type in the world.

Salving a Stern-Wheeler

By Lieut. R. M. Reynolds, R. N. R.

NAVIGATION on a West African river is by no means easy or devoid of danger, and although very few lives are lost through accidents to vessels, it is by no means uncommon for disaster to overtake one of these frail river craft.

The delta of the Niger presents few difficulties to the pilot, and the dangerous rocks in the river between Etobe and Lokoja, a distance of 29 miles, are so well known to the majority of pilots that few ships strike them; but between Etobe and the delta is a dangerous zone where sunken trees are prevalent. These trees, or as they are called, snags, are washed away from the banks of every high river, and as they often bring up in places which were previously clear they become a source of great danger, and many ships have come to grief through striking them. It is, of course, possible during low river to remove a number of these obstructions, and many of the more dangerous are blown up, but there are always others unknown on which vessels occasionally strike.

Rather more than a year ago the Sultan, a new stern-wheeler belonging to the government of Northern Nigeria, struck one of these snags and would have sunk had she not been held up by it, and it is to describe the method by which she was salved that this article is written.

Struck a Submerged Snag.

The Sultan was a small stern-wheel steamer 75 ft. long, and divided into five watertight compartments, the forepeak, bunker, fore hold, after hold and engine room. On her second trip down river, when about 125 miles from Lokoja, she struck a submerged snag, and as at the time she was traveling over the ground at 10 to 12 knots an hour the impact was enormous. A hole was torn in the port side from the fore side of the bulkhead dividing the fore peak and bunkers, and extending along the forward bulkhead of the fore hold, where the snag brought up, but not before it had started the latter bulkhead. The engine room was also slightly holed, probably by another snag. The only compartment intact was the after hold; but as a manhole door on the bulkhead between it and the engine room was open at the time the vessel struck, this hold filled as well.

Fortunately for all on board (and there were probably between 40 and 50 persons, including some European passengers), she remained impaled on the snag, her upper deck above water, and all on board made their way safely on shore. Only one life was lost and that through the foolhardiness of a man who was drowned in the hold while diving to recover some effects.

As soon as news of the wreck was received in Lokoja, two stern-wheelers and a lighter were dispatched to render assistance. By the time they arrived the Sultan had slewed round with her head pointing up stream, and had heeled over to such an extent that the after part of the sun deck on the port side was submerged.

First Work of Salvage.

The first efforts of the salvage party were directed to raising the ship sufficiently to clear the lower deck of water so that the various compartments could, if possible, be pumped out. To this end a sling was placed round the port sponson, and one of the stern-wheelers, the Valiant, took up her position on that side with two large spars, to which the purchases were made fast, projecting over her bows. The purchases were then shackled to the sling and hove away on until the Sultan assumed an upright position, when a sling was passed round both sponsons so that it led up right aft in the fore and aft line of the ship. Another sling was passed under the hull in the wake of the engine room, and a further sling forward in the wake of the boiler. This forward sling was brought up on one side to the lighter, to which it was securely lashed, and a purchase from the second stern-wheeler, the Sarota, shackled on to the other end of it. The after and forward purchases were then hove away on, but the Sultan was so firmly wedged on the snag that it was impossible to lift her sufficiently to free the lower deck from water, and everything had to remain as it was until the arrival of a passing steamer. This latter vessel made fast to the sling under the engine room, but when all was in readiness for heaving away the forward purchase was accidently surged, and the sudden strain thrown on the Sarota's windlass broke one of the wheels so that the work had again to be suspended until a new wheel could be obtained. The third vessel then proceeded to Lokoja.

A new wheel was made for the Sarota's windlass and sent down, together with another lighter, as at that time no other ship could be spared. It was, however, found impossible to do any good without the help of a third ship, so the forward and after purchases were hove up as taut as possible, and the sling under the engine room lashed to the second light-

er, in readiness for the third vessel to hook on to the other end. When everything was in this position a heavy tornado blew for over two hours, and there was great danger of the vessels breaking away from the purchases. Fortunately, however, nothing parted, and the next day the third ship arrived.

Progress of the Work.

This ship, the Empire, had a very powerful windlass, and with little further difficulty the lower deck was hove up clear of the water, but the Sultan still remained firmly wedged on the snag. A small salvage pump was then put down the after hold, but as no effect was made in reducing the water, men were send down into the engine room with sand bags and oakum to stop up any leaks they could find. While they were doing this, a flexible steam pipe was led from one of the ships to the Sultan's bilge pump and connected to it. With this and the salvage pump going the level of the water in the after hold and engine room was quickly reduced, and the manhole door on the bulkhead between these two compartments was then bolted up. The after hold was next pumped dry, and the holes in the engine room plugged sufficiently to keep out any large quantity of water. With these compartments empty the Sultan was quite buoyant aft, but not yet clear of the snag although she showed signs of moving, and shortly after the current, acting on the ships and lighters, dragged her off. The little flotilla then drifted and steamed to an adjacent sand bank until the inner ship grounded, after which the purchases were eased up and the Sultan allowed to rest on the bottom. Two of the assisting ships were then sent away, and the lighters brought alongside the Sultan, one on each side, and filled with water until they sank as low as was compatible with safety. Three large standing spars were next placed right across the Sultan and lighters, and securely lashed to the slings that had been used for lifting her. When this was done the lighters were pumped dry, and as they rose lifted the Sultan until she floated between them. Nothing could be done to the three forward compartments as the damage was too extensive.

Numerous Difficulties Encountered.

A written description cannot perhaps convey to the reader the numerous difficulties that this small salvage operation presented to those engaged on it. It must be remembered that the only steamers that could render assistance were lightly-built stern-wheelers, and that there were no divers available, also that the current ran at a rate of about four miles per hour, and that the water was of much the same consistency as is the Thames at London Bridge, making the work for the natives, who went under water without diving-dress, both difficult and dangerous.

The work was superintended by a European officer, who had under him a white master and engineer, but all the labor was native, and more or less unskilled, although a few men were indefatigable in placing the slings under the Sultan's bottom and diving in the engine room to stop up holes, and really gave very valuable assistance.

The operations were also made more arduous through the Sultan being hung up on the snag, which was an enormous tree of exceedingly hard wood, to cut through which would have been impossible with the appliances at hand, and to blow up equally so; the latter on account of the damage that the hull might have received and the almost impossible task of placing explosives without the help of professional divers.

Accident Worse Than Usual.

Neither were the stern-wheelers, with the exception of the Empire, fitted with powerful windlasses, and the vessels themselves having so little free board it was difficult to arrange the spars, to which the purchases were secured, high enough to obtain sufficient drift for a long heave, so that there was necessarily a large amount of fleeting. The lighters, too, were very cranky, and more than once narrowly escaped capsizing when a heavy strain was thrown on them.

This accident was far worse than is usual, for it seldom happens, when a ship strikes a snag, that more than one compartment is damaged, in which case the ship can be taken into shallow water, grounded, and the leak temporarily stopped.

Even when the Sultan was floated the anxieties of the salvage party were by no means ended, for she was over 200 miles from Burutu, the nearest place where it was possible to effect repairs. She was, however, safely but laboriously brought there under her own steam, the lighters keeping her afloat during the voyage down river, and it was a relief to all concerned when she was at length grounded by the river bank at her destination.

CANADA AND SHIPPING SUBSIDIES.

The Canadian government would appear to consider necessary the payment of shipping subsidies as a means of expanding the field of operations for the commerce of the country. The following statistics, showing the amounts paid for mail subsidies and steamship subventions during the year 1908-9, may be of interest to readers of THE MARINE REVIEW.

The whole amount paid for this purpose during the year amounted to $1,684,680. The following statement shows the subsidies paid to the steamship lines, in excess of $10,000, plying between Canadian ports and the several countries: United Kingdom, $565,000; Australia, $190,000; New Zealand, $46,000; South Africa, $145,000; France, $150,000; Mexico, $90,000; China and Japan, $120,000; and South America, $65,000.

Steamships plying between the following ports received the amounts of subsidies given: St. John-Halifax-London, $40,000; Montreal-Manchester, $35,000; Halifax-St. John's-Newfoundland-Liverpool, $20,000; St. John's-Glasgow, $12,000; Halifax-Jamaica, $15,000; Victoria-Vancouver-Skagway, $12,000.

It is generally considered that the subsidies for 1910 will show a considerable increase over those of 1909, the government having already made arrangements with additional steamship lines in anticipation of an increased trade with New Zealand and France; with the former for the purpose of providing transportation facilities from Montreal to Australasian ports for Canadian products, which are now being forwarded via New York, and this service will begin with the opening of navigation on the St. Lawrence, about the first week in May, on a monthly service. It is also expected that there will be three direct steamship lines to ports in France for the coming season—one to Havre, another to Cherbourg, the third not yet being chosen.

THE BRAZILIAN BATTLESHIP.

It is now reported that the third battleship for Brazil, to be named the Rio de Janeiro, unlike the Minas Geraes and Sao Paulo, is to be fitted with turbine-propelling machinery, thus adding another to the already important list of turbine contracts now in hand at Messrs. Vickers, Sons & Maxim's, Barrow. It is estimated that there is at present under construction, or about to be commenced, at the Barrow engine works turbine machinery of no less than 200,000 I. H. P. Like the Minas Geraes, the Rio de Janeiro will be built at Elswick by Sir W. G. Armstrong, Whitworth & Co.

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OUR FOREIGN CARRYING TRADE.

Great Britain has 8,535 steamers of 14,193,582 tons. The United States has but 1,200 steamers, practically all in coasting service and about half of them on the great lakes.

As the steamer's ability to make trips is greater than that of the sailing vessel, usually reckoned 2½ times that of the sailing vessel, Britain's potential tonnage is 36,907,579 as against 6,003,704 for the United States. Unquestionably Britain gained her lead by the policy of subsidizing her steamships for the carrying of the mails.

British shipping increased six-fold in the period from 1840 to 1876. She also had in 1854 the good sense to put the management of her merchant marine into the hands of her Board of Trade that it might be pushed forward by the combined skill of experts, unhampered by the blunders of uninformed legislators.

It should be borne in mind that wages and provisions of ships' crews and equipping and repairing ships and engines, renewals and earnings are as much a part of the exports of a country as if they were actual commodities.

The net earnings of the British merchant fleet equaled the combined earnings of all the railroads in the United States.

Shipbuilding is an industry which calls for the products of and furnishes employment to nearly every other industry in the country.

The wheat crop of the United States exceeds in value but little the earnings of Britain's merchant fleet. The entire hay crop of the United States is only about the earnings of England's merchant fleet.

The question has been repeatedly asked "If others can carry your products cheaper than you can carry them yourselves, why not let them do it?" This question has been asked for a century or more. It was asked of Washington and he said "No;" it was asked of Jefferson and he said "No;" Madison and Jackson both said "No." Are there any better Americans than these? England's answer to the question has been "No" for over 300 years.

IMPROVING THE LITTLE KANAWHA.

How many are there in the United States who know anything about the Little Kanawha river? How many have heard of that stream? Barring the people of the state of West Virginia, it is doubtful if there is one person in a hundred who knows anything at all about it. Still the government has expended more than $500,000 in improvements on the Little Kanawha, and the end is not yet. Back as far as 1875 the government began making examinations of the conditions on that stream, and the last river and harbor act provided for another examination. No less than six reports relative to the improvement of the Little Kanawha have been submitted to congress since 1875. It appears that every new congressman from that district finds it necessary to have additional examinations made.

It has been said that the present congressman from the Little Kanawha district practically based his last campaign on improving the river, and that he is now urging its further improvement. This improving of rivers appears to be the safest and cheapest campaign ammunition for candidates to congress. It appears to have been used with success from the very beginning. There has not been a candidate from the Ohio river districts who has not used it, and an examination of the reports of the chief engineers, U. S. army, will show to what extremes congressmen have gone in their endeavor to carry out their campaign pledges. Thousands of dollars have been spent for dredging insignificant harbors and for building embankments along the river fronts of country towns.

There is, however, some justification in the government improving the Ohio; it is a large river and flows along the border of seven states. But what about the Little Kanawha? Is there anything to justify its improvement by the general government? And there is the trouble; we do not consider the improvement of our inland waterways from a strictly business point of view. Considering the Little Kanawha: What does it offer to the people at large? What is the nature of the land through which it flows? Should it be improved, who will be benefited?

The Little Kanawha river rises on the western slope of Laurel hill, flows through Braxton, Gilmer, Calhoun, Wirt and Wood counties of West Virginia, and empties into the Ohio river at Parkersburg. It is 158 miles long and lies entirely in the state of West Virginia. The average width of the Little Kanawha will not exceed 175 feet, and its banks along the upper part are very steep, the country through which it flows being generally hilly. The bed of the river consists of sand and gravel with many

large boulders; there is rock, however, in several places.

The land, being generally hilly, farming is not carried on extensively. State reports indicate good coal in large quantities along the river. There are also oil, timber and limestone. The timber along the river has been thinned out and little, if any, coal is shipped by river from the Little Kanawha fields.

With the exception of Parkersburg, which is at the mouth and is in reality an Ohio-river town, there is not a town of any size along the river. Parkersburg may have 25,000 inhabitants, but it is doubtful. Including Parkersburg, there are not more than 75,000 people in the Little Kanawha valley. The principal towns are: Burnsville, Sand Fork, Glenville, Grantsville, Brookville, Creston, Burning Springs, Palestine and Elizabeth. Not one of these towns had a population of 1,000 at the time of the last federal census.

In 1867 the Little Kanawha Navigation Co. began the building of four locks and dams, which structures were completed in 1874. They provide 4-ft. navigation for a distance of 41 miles from the mouth of the river. The locks gave a clearance of 125 ft. by 23 ft.; that is, a boat 125 ft. by 23 ft., and drawing not more than 4 ft. could be passed through the locks. Both the locks and the dams were of ordinary construction, and were operated and maintained as cheaply as possible. The lockmen were paid from $35 to $50 per month; there was little or no plant for making repairs (no floating plant at all); in fact, the structures were allowed to decay. It is said the company made money, and well it could. There were no railroads, much timber was brought down, and the property was not kept in repair.

The government built a lock and dam near Burning Springs, which extended 4-ft. navigation to Creston, about 48 miles from the mouth. Work on that lock and dam was begun in 1885 and completed in 1891. This lock will pass boats 125 ft. by 26 ft.

In November, 1905, the government purchased the locks and dams from the Navigation company, paying $75,000 for the structures. Since that year more than $150,000 has been spent in repairing and improving them. The government increased the salaries of the lockmen to $50 a month and provided an additional man for each lock at a salary of $45 a month. There is not enough work at a lock to keep one man employed, still the government has two. The tolls charged by the Navigation company were removed immediately on the government's assuming charge of the structures.

What has been derived from all these expenditures? In 1892 the tonnage which passed Lock No. 5 (the uppermost lock) was reported as 244,254, and that for 1908 for the same lock as 49,707. It has cost more than $2,000 a year for 19 years to operate and maintain Lock No. 5, and it will cost more than that to maintain each of the purchased locks, Nos. 1 to 4, after their repairs are completed. In other words, to provide a free right of way for a distance of 48 miles for about 100,000 tons a year will cost the government more than $10,000 annually, or 10 cents a ton. What has this tonnage consisted of? Saw logs, railroad ties, etc. Out of the 49,707 tons which passed Lock No. 5 in 1908, 42,772 tons consisted of timber products, of which 25,110 tons were saw logs. Only 76 tons of coal was carried, and that was taken upstream, none being shipped by water from the Little Kanawha fields. In 1901, 112,880 tons were timber products out of a total tonnage of 119,439.

There are no manufacturing plants of consequence along the Little Kanawha, except the carbon factory near Grantsville. The present locks are too small to permit the use of water transportation for coal, nor do they extend slack water navigation to the coal fields. Should such locks be continued to the coal fields, it is extremely doubtful if there would be sufficient water. On the Ohio coal cannot be profitably carried by water on less than 6 ft. Can it be carried to advantage on the Little Kanawha on 4 ft.? In regard to the low-water flow, Major Lockwood reported in 1894 as follows:

"The water supply during the summer months is insufficient, as the system now is, to keep the pools full, and, with additional locks and dams, the area of the water surface would be much increased, and loss from evaporation consequently greater than at present; the result would be that the system would become inoperative earlier in the summer than now. If the old dams were made as tight as the present government dam navigation would last some longer than it does now, but with the system extended and all the dams tight there would be a long time each year when none but the lightest draught boats could run, and times when even such navigation would fail."

Steamboatmen familiar with the conditions on the Little Kanawha, men who have operated boats on that river, have said that it would be money wasted to carry the improvement further, and a careful reading of the reports submitted by the different officers in charge of the work indorse that statement. Should the coal fields, which the advocates of slack-water extension base their claims on, be developed, railroads would be extended at once. A line was projected and construction work commenced, but it was abandoned. No doubt work on that line will be resumed as soon as conditions justify.

There is no question but that the inland waterways should be under the control of the government, but it is questionable if the improvement of such streams as the Little Kanawha for navigation purposes will ever justify the expense; in fact, it is doubtful if there is a river under improvement for navigation purposes in the United States today which justifies the expense in benefits to the people at large. Tolls were discontinued at the Monongahela river, but consumers pay more for coal now than formerly. Tolls were abolished on the Little Kanawha, but there was no downward tendency in the price of timber, nor has it changed the price of any of the commodities carried. The Great

Kanawha river has slack water the year round, which costs the government fully $100,000 a year to maintain, and on which more than $5,000,000 were expended as first cost; but coal carried on this river costs the consumer as much as coal carried by rail. Who gets the benefits? The steamboat men and the shippers.

The facts are that inland waterway improvement must be put on a broader basis; it must include pure water supply, prevention of floods and erosion of banks, development of water power, and the propagation of food fish. The improvements required for navigation alone are too costly, and should be linked to those that will benefit the people direct.

THE DECLINE OF THE TRAMP.

As indicating the spirit of change which is inseparable from the conduct of modern business, the following paragraph from the report of the board of directors of the Cunard Steamship Co. is quite significant. Truly the old order giving way to the new:

"A great change has been slowly but surely coming over the Atlantic freight business, a change which must today be clearly recognized and faced. On the one hand we find that the rapidly growing population of the United States will, before very long, absorb that country's entire production of food stuffs; on the other hand, while 20 years ago the passenger steamer had to be supplemented by the cargo steamer, today the modern type of steamer of moderate power in proportion to her large size is able to do the work of both. There does not, therefore, appear to be much further prospect of profitable employment of purely cargo steamers at such ports as Boston and New York, and we have, accordingly, decided to sell our only remaining vessel of this class, the Sylvania."

It has been repeatedly pointed out, especially by James J. Hill, of the Great Northern railway, that the population of the United States would eventually consume its entire wheat crop and have none for export. Farming of an intensive character is now required. Any increase in exports must come from articles of a manufactured character. Apparently, also, the tramp steamer in such established lanes as the North Atlantic must give way to the intermediate passenger steamer, vessels of enormous carrying capacity.

MISSISSIPPI RIVER BARGES.

Editor MARINE REVIEW:

I have a copy of your April number, containing a picture of our barges and some printed matter taken from our circulars. I wish you would give me space to make a brief reply to your criticism of them.

In regard to your criticism of the use of the word "yacht-like," if you are as familiar with yacht construction on the lakes in recent years as you are with freight carrying craft, you will know that the type commonly referred to among the reporters as a sidewalk yacht, which has a long, flat raking bow, has attained considerable speed and goes through the water with little effort. This was the type which we had in mind.

The modification of the Great Lakes freighter has reference entirely to the shape of the cargo carrying box, which is built within the hold, and to the flat decks, and numerous hatches, which are certainly of the lake type, and absolutely different from anything used on rivers anywhere else in the world.

As to the ability to build such a boat and the weight that is available, which you say would be 600 tons for hull and equipment, a little figuring will show you that on the proportions given you your estimate is wrong. Supposing that the boat draws but 1 ft. light, which is the figure you were basing it on, then her displacement of water at 1 ft. draught is 33,000 cu. ft., or something more than 1,000 tons. As a matter of fact, this announcement was made before we had the complete figures or her weight, which proves to be light about 1,500 tons, giving her a draught light of 1 ft. 5 in. She then takes 1,000 tons for every foot of displacement up to her maximum of 7 ft. 6 in.

Concerning the horsepower and speed of the boat, it is impossible for me to give you any better estimate than that we have previously made now, but the model of her is being tested out in the tank and we will know in a short time just what horsepower she will require for fast package service.

The boat, I may add, carries heavy bridging in both sides and also in the longitudinal bulkhead down the center and is further provided and braced with cross bulkheads every 50 ft.

Very truly yours,

MISSISSIPPI VALLEY TRANSPORTATION CO.,
John L. Mathew, Secretary.

(Our correspondent stretches the definition of a yacht somewhat beyond the elastic limit. Boats of the "sidewalk" type are not yachts any more than a self-propelling pile-driver is a steamship, the reporters to the contrary notwithstanding. Our criticism as to weights and displacements was exactly correct. The displacement quoted at light draught was 1,000 tons. The boilers, machinery and fuel would account for certainly 400 tons of this, leaving only 600 tons for hull and hull equipment weights. That our estimate was well grounded is borne out by Mr. Mathew's letter, in which he says the light displacement will be 1,500 tons instead of 1,000. However, we think it will be found that even the revised estimate is too low, and this even with machinery designed for 2,000 horsepower. That the proposed boat will ever reach a speed of 16 miles per hour, either loaded or light, with 2,000 horsepower, is scarcely debatable, and tank results are of little value as an indication of what may be expected in a relatively narrow, shallow and tortuous stream, such as the Mississippi river.)

WANTED—A JOB.

Educated at the U. S. Naval Academy, Annapolis, Md., at a cost to the government of about $30,000.00. Spent three or four years at sea as a line officer to learn ship conditions. Assigned to the Construction Corps of the Navy presumably because I gave promise of making good in the job. Sent abroad and spent three years at the best technical school and engineering works, studying ship building and engineering—at the expense of the government at a cost of about $15,000. Have been engaged for the past 18 years at the largest ship yards and navy yards, building and repairing ships and machinery. Have made management of large industrial establishments my specialty. Well known to the engineering world and my reputation as a manager and engineer among those whose opinion is of any value is the best. Have refused in the past offers to take charge of large establishments because I believed my duty was to the government that had educated me.

Reason for wishing to make a change—I am no longer wanted by the government. The navy is not run for the country and the benefit of the country, but is run for the benefit and glory of line officers. Experience has proved that line officers of the navy by divine right are the greatest diplomats, astronomers, designing engineers, marine engineers, navigators, gunnery officers, electrical engineers, pursers, accountants, naval architects, and managers the world has ever seen. By divine right these officers are the best equipped to design,

and manage large industrial establishments, although they have hardly seen the inside of a ship. I am to be replaced by these "divine right" officers and must find a job outside of the navy.

Address,

ABILITY AND EXPERIENCE
NOT WANTED IN THE NAVY,
Care Divine Right Aide for Material,
Navy Department, Washington, D. C.

WHIRLPOOL RAPIDS RACE.

The whirlpool rapids race, projected by *Power Boating*, will be run on Saturday, September 17, in Niagara river, the course being from the Maid of the Mist landing below Niagara Falls to Pitz's dock at Lewiston. The race is for a cash prize of $1,000 offered by *Power Boating* and a $500 gold cup offered by John A. Penton. The committee in charge of the event consists of Hon. O. W. Cutler, Niagara Falls, N. Y., chairman; Edward F. Dold, Motor Boat Club of Buffalo, Buffalo, N. Y.; John Robinson, Buffalo Launch Club, Niagara Falls, Ont.; Arthur Schoellkopf, president Niagara Falls Hydraulic Power & Mfg. Co., Niagara Falls, N. Y.; W. H. Philpott Jr., Buffalo Launch Club, Niagara Falls, N. Y.; Charles S. Alt, fleet captain, Buffalo Launch Club, Buffalo, N. Y.; Henry Penton, of Babcock & Penton, naval architects and marine engineers, New York and Cleveland; Robert E. Power, editor *Power Boating*, Cleveland.

Undoubtedly this race will attract worldwide attention and draw enormous crowds. The conditions of the contest are :

1. Saturday, September 17, 1910, shall be date of this contest.

2. No restrictions shall be placed upon the form of mechanical power, but every boat shall be able to operate under its own power.

3. Contestants shall satisfy the committee that they have made careful personal examination of the course.

4. Boats shall of decked or closed type, and cockpit, if fitted, shall be of self bailing type and deck erections shall not exceed 16 inches in height above deck. The openings in same, if any, shall not exceed 12 inches in diameter and shall be fitted with standard port lights.

5. Ignition systems shall be securely fastened and protected from water. Air inlets must be protected against the entrance of water. The machinery installation shall be properly and thoroughly fastened and all equipment properly stowed and secured. Steering gear shall be substantial and well fitted and subject to approval.

6. No restrictions shall be placed upon the number of crew.

7. Contestants shall be started away at intervals of not less than 10 minutes. This interval may be increased at the option of the committee.

8. The boat finishing the prescribed course under her own power in the shortest time will be declared the winner.

9. The course shall be from the Maid of the Mist landing on the Canadian side, or some point above the bridges as may be decided later, down to and around a turn about one-half mile below Queenston dock, thence to Pitz's dock at Lewiston.

10. Boats, crews and equipment shall be subject to approval of committee The committee reserves the right to modify these conditions as in its discretion may seem advisable.

OBITUARY.

Rear Admiral Philip Hichborn died in Washington, May 1, at the age of 71 years. After 32 years of active service, Admiral Hichborn, who, at that time, was chief constructor of the navy, was retired in 1901, with the rank of rear admiral. He entered the navy in 1860 as an assistant naval constructor, six years later being made full constructor, and in 1893 chief constructor. He invented the Hichborn balanced turret and the Franklin life buoy.

Capt. John A. Wood, aged 79, one of the most widely known rivermen in the United States and an almost lifelong resident of Pittsburg, died April 16 at his home in San Diego, Cal., where he had resided for the last five or six years. Capt. Wood was born in Pittsburg and was a son of Jonathan H. Wood, a boat builder. Although only 18 years old when his father died, Capt. Wood succeeded his father in business. Before steamboats were in use, Mr. Wood built most of the coal boats that were used in floating coal from this vicinity to the Southern markets. Later Capt. Wood became identified with the Wood & Horner Co., which built the D. L. Hyatt, the first steamboat launched in this vicinity.

Walter J. Schlafer, vice president of Smith, Davis & Co., of Buffalo, N. Y., was stricken with apoplexy at his desk, April 4, and died four days later at his home, 153 Jewett avenue. Mr. Schlaefer had, during his entire business life, been identified with the canal forwarding, and afterwards with the fire and marine insurance business. He came to Buffalo in 1879 and entered the employ of Lotheridge & Gallagher, who were then in the canal forwarding business, with offices located on the old Central Wharf. In 1880, he attracted the attention of Edward B. Smith and Townsend Davis, who were then operating under the firm name of Smith, Davis & Clark, and from that time until his death, remained either in the employ or as an officer of that company, afterwards incorporated. Mr. Schlaefer was very closely identified with the Erie Canal interests, and was probably as well informed upon that subject as any underwriter in western New York, and his ability as an underwriter was recognized by the insuring public along the Canal and Great Lakes. He is survived by his wife, and one daughter, Mrs. Francis J. Rohr, of Buffalo, and by his mother who now resides in Tarrytown, N. Y.

WALTER J. SCHLAFER.

LAKE LAUNCHINGS.

The steamer Joseph Wood, named in honor of the first vice-president of the Pennsylvania Railroad, was launched at the Lorain yard of the American Ship Building Co. on April 16. The Wood will be managed by M. A. Hanna & Co. The new steamer is 524 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep.

The bulk freighter St. Clair, building for the Northern Lakes Steamship Co., was launched from the Ecorse yard of the Great Lakes Engineering Works on April 16. The St. Clair is 465 ft. over all, 444 ft. keel, 56 ft. beam and 30 ft. deep.

The bulk freighter A. M. Byers, building for the North American Steamship Co., was launched from the Cleveland yard of the American Ship Building Co. on May 7. The Byers is 525 ft. over all, 504 ft. keel, 54 ft. beam and 30 ft. deep.

The bulk freighter Peter Reiss, a dup-

licate of the Byers and building for the same company, was launched on Monday, May 9, from the Superior yard of the American Ship Building Co.

The passenger steamer Ste. Claire, building for the Detroit, Belle Isle & Windsor Ferry Co., was launched from the yard of the Toledo Ship Building Co., Toledo, on May 7.

OPENING OF LAKE SEASON.

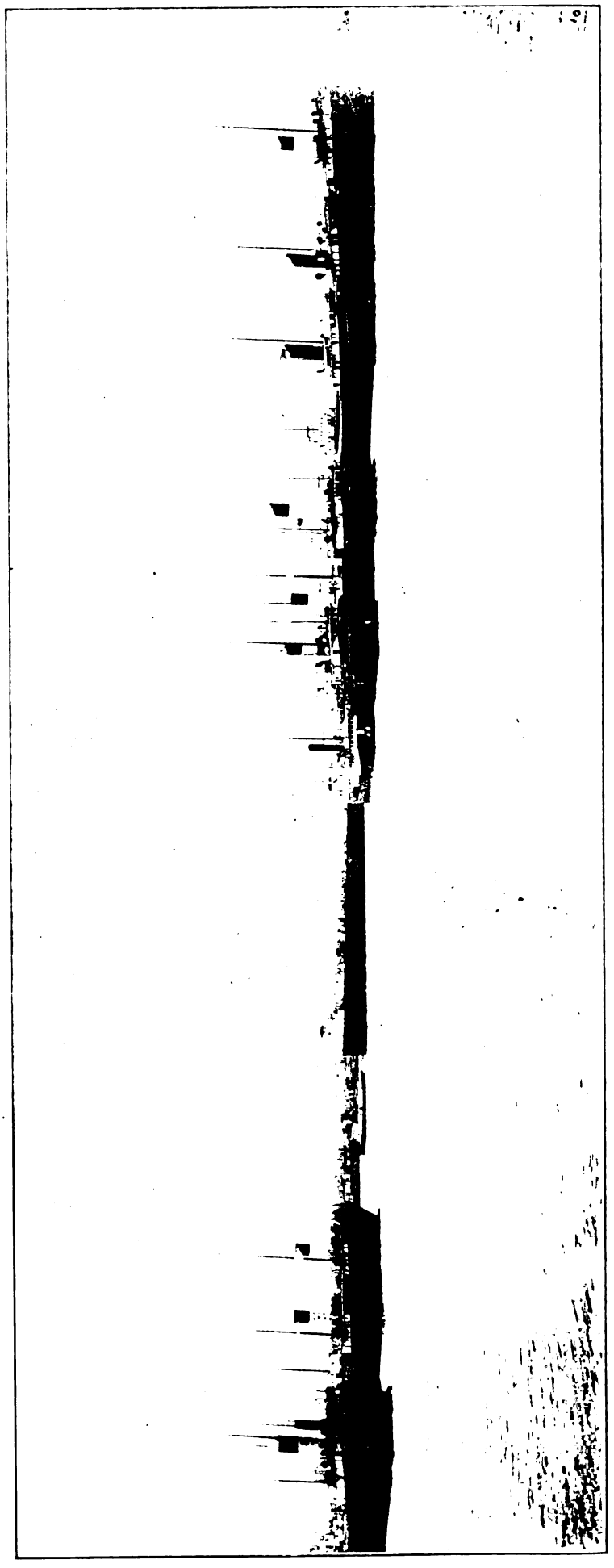
Navigation on the great lakes opened on April 15, the earliest in years, though full advantage could not be taken of it owing to the fact that the American locks at the Sault were not in commission, all commerce being handled through the Canadian lock, with consequent congestion to shipping, as high as 100 vessels lying in waiting to lock through. This condition would have been very serious had business been urgent, but the ore trade took quite a slump, limiting ore shipments, while the coal strike prevented a normal quantity of coal reaching the Erie docks. Notwithstanding these obstacles, however, the business handled during April was the heaviest on record for that month.

Hull insurance has been placed upon a basis of 6 per cent, which is 1 per higher than last year, but underwriters have offered to refund 10 per cent of the earned or net premium to all vessels which operate throughout the year without accident. This is regarded as a very wise provision by vessel owners, who will share the refund with their masters.

An insurance rate of 8 per cent has been established on ore and coal cargoes, which is an advance over last year's rate. The freight rate on coal to Milwaukee has been fixed at 35 cents. Milwaukee usually pays 5 cents over the rate customarily paid to Green Bay ports. During April shippers handled their requirements in their own vessels, but the chartering of wild tonnage has now begun and within two weeks it is expected that navigation will be in full sway.

The dock superintendents at Lake Erie ports have decided to give ore and coal handlers an advance of 5 per cent in wages. The new schedule went into effect May 1.

The executive committee of the Lake Carriers' Association met in Cleveland during the month and advanced the wages in certain departments aboard ship. The mates on first-class steamers get an advance of $5 a month, or $130. Cooks on first-class steamers get an advance of $4



VESSELS AT THE SAULT WAITING TO LOCK THROUGH.

per month, or $90. The schedule for the balance of the crew follows:

Porters to Oct. 1	$30.00
Porters, Oct. 1 to close of navigation	35.00
Firemen, oilers and water tenders, Oct. 1.	52.50
Firemen, oilers and water tenders, Oct. 1 to close of navigation	65.00
Wheelsmen-lookoutsmen, to Oct. 1	55.00
Wheelsmen-lookoutsmen, Oct. 1 to close of navigation	65.00
Wheelsmen, to Oct. 1	50.00
Wheelsmen, Oct. 1 to close of navigation	65.00
Lookoutsmen, to Oct. 1	50.00
Lookoutsmen, Oct. 1 to close of navigation	31.50
Ordinary seamen, to Oct. 1	31.50
Ordinary seamen, Oct. 1 to close of navigation	40.00

Wages of seamen, firemen, oilers and water tenders employed in fitting out shall be $2 per day while they are not boarded on vessel.

Wheelsmen-lookoutsmen are men who stand a three-hour trick at the wheel and three hours watch on deck each watch.

Wheelsmen are men who stand a trick at the wheel, but will not watch.

Lookoutsmen are men who stand a watch on deck but cannot wheel.

Handymen, where carried, same wages as firemen.

ORE SHIPMENTS DURING APRIL.

Ore shipments during April were the heaviest on record for that month, 1,520,305 tons having been moved. This record has been approached but once, when 1,447,386 tons were moved, in April, 1906. Last year, during April, the mines were not prepared to ship, only 55,794 tons being moved.

Following were the shipments by ports:

ORE SHIPMENTS DURING APRIL.

Port.	April 1909.	April 1910.
Escanaba	47,123	223,025
Marquette	.....	135,559
Ashland	3,671	218,703
Superior	.....	355 307
Duluth	.....	309,427
Two Harbors	.....	278,284
Total	55,794	1,520,305
1910 Increase		1,464,511

ORE ON DOCK MAY 1.

Statistics gathered from the various dock managers at Lake Erie ports show that the amount of ore on Lake Erie docks May 1 of the present year was 5,444,080 tons, as against 5,370,268 tons in 1909, an increase of 73,812 tons. These figures are exclusive of April receipts at Lake Erie ports.

The total rail shipments from Lake Erie ports to furnaces during the winter season (Dec. 1 to May 1) aggregated 3,521,709 tons, viz:

On dock Lake Erie ports, Dec. 1, 1909	8,965,789
On dock May 1, 1910	5,444,080
By rail to furnaces, winter of 1909-10	3,521,709

Adding these winter shipments to 30,077,304 tons, the amount shipped to furnaces during the navigation season of 1909, gives 33,599,013 tons as the entire consumption of ore from Lake Erie ports during the year ended May 1, 1910, as against 20,524,523 tons for the year ended May 1, 1909; as against 31,692,446 tons for the year ended May 1, 1908; as against 30,099,769 tons for the year ended May 1, 1907; as against 28,984,358 tons for the year ended May 1, 1906; 20,057,070 tons for the year ended May 1 1905; 18,739,995 tons for the year ended May 1, 1904; 21,905,251 tons for the year ended May 1, 1903; 17,216,065 tons for the year ended May 1, 1902; 14,465,260 tons for the year ended May 1, 1901; 15,882,881 tons for the year ended May 1, 1900; 12,122,982 tons for the year ended May 1, 1899, and 10,209,488 tons for the year ended May 1, 1898.

The following table gives the amount of ore on dock at the close of navigation last year and the opening this year:

Ports.	May 1, 1910.	Dec. 1, 1909.
Toledo	366,631	332,456
Sandusky	22,468	39,557
Huron	336,693	477,323
Lorain	205,445	407.129
Cleveland	985,725	1,547,142
Fairport	541,299	867,640
Ashtabula	1,609,931	2,594,359
Conneaut	461,365	1,411,002
Erie	550.187	788,046
Buffalo	364,336	501,125
Total	5,444,080	8,965,789

APRIL COMMERCE SAULT CANAL.

The commerce of Lake Superior was handled exclusively by the Canadian lock at Sault Ste. Marie during April, as the American locks were out of commission. The total commerce amounted to 1,958,913 tons, distributed as follows:

EAST BOUND.

Articles.	Total.
Copper, net tons	5 447
Grain, bu.	4,549,528
Flour, bbls.	386,583
Iron ore, net tons	937,049
Pig iron, net tons	1,850
Lumber, M. ft. B. M	6,025
Wheat, bu.	7,926 518
General merchandise, net tons	4,270
Passengers, number	218

WEST BOUND.

Coal, hard, net tons	179,596
Coal, soft, net tons	360,327
Flour, bbls.	400
Manufactured iron, net tons	24 833
Salt, bbls.	46 676
General merchandise, net tons	62,070
Passengers, number	396

SUMMARY.

Vessel passages, number	768
Registered tonnage, net	1,812,404
Freight:—	
East bound, net tons	1,325.379
West bound, net tons	633 534
Total freight	1 958.913

LAKE MICHIGAN ORE RECEIPTS.

Out of the total shipments of 1,520,305 tons of ore from the mines during April, 179,911 tons went to Lake Michigan ports. The receipts of ore at the various Lake Erie ports are not yet all in. Following are the Lake Michigan receipts:

South Chicago, Ill.	155,754
Gary, Ind.	10,877
Milwaukee, Wis.	.....
Indiana Harbor, Ind.	7,794
Elk Rapids, Mich.	5,486
Fruitport, Mich.	.....
East Jordan, Mich.	.....
Boyne City, Mich.	.....
Total	179,911

LOADING FOR POE LOCK.

The draught at the Poe lock is 18 ft., as against 18 ft. 8 in. for the Canadian lock. As nearly all of the big vessels were loading for the deeper draught the opening of the Poe lock did not mean very much when it came to relieving congestion. The members of the Lake Carriers' Association have now agreed to load one-third of their vessels for the Poe lock, and President Livingstone has been instructed to issue a circular to that effect. The new loading arrangement will become effective May 16.

RULES FOR SAULT CANAL.

There have been several conferences this year as to the rules for the movement of vessels through the locks at Sault Ste. Marie, and Superintending Engineer Ross of the Canadian lock has prepared the following rules to govern the movement of boats:

All downbound vessels, when waiting for the lock, must tie up at the north side of the entrance or at the south pier beyond the bend.

All upbound vessels, when waiting for the lock, must tie up at the south pier, below the bend, unless otherwise directed by the linesman on the pier.

Linesmen will be stationed on the south lower entrance pier and on the north wall of the upper entrance just below the bend and on the south upper pier.

The duties of these linesmen are to take lines from vessels until they get their own linesmen ashore, and to direct the movement of the vessels. They are not expected to carry the lines ahead beyond the limits of their beats. All vessels using this canal must take their turn, and if traffic becomes congested so that there is not room at the piers for all waiting vessels the latest arriving vessels must come to anchor in the river until there is room for them in the entrance.

No vessel must attempt to pass or

take the turn of any vessel so waiting at anchor excepting those which have the right of way, according to rule 24 of the canal regulations, or small vessels which may lock with large ones, but must come to anchor and wait her turn.

A patrol vessel will be stationed in the river above the lock to control the movements of vessels, and masters of vessels will take their instructions from this patrol vessel. In the event of there being no vessels at anchor and no patrol boat in sight, a vessel may proceed to the lock.

Masters of vessels must be prepared to report the draught of their vessels at bow, amidship and stern. No vessel will be passed through the lock drawing more water than the recommended draught.

LLOYDS REGISTER AND THE GREAT LAKES.

That world-famous institution, Lloyds Register of Shipping, has finally turned its attention to the great merchant fleet trading on the Great Lakes.

In all matters appertaining to the construction and classification of seagoing vessels Lloyds Register has long been recognized as the paramount authority of the world. The certificates of that Society are everywhere recognized by the International Shipping Community as final evidence of first class construction and seaworthiness.

Nearly 21,000,000 tons of shipping now afloat hold classes assigned by the Committee of Lloyds Register. These figures include over 9,000 steamers and no other similar Institution classes one-fifth of that number. At the present time almost 1,000,000 tons of shipping are being built under the special survey of the Society's Surveyors with a view to classification.

During the last ten years new vessels to the extent of over 12,000,000 tons have been classed by the Society. These figures clearly illustrate the pre-eminent position which Lloyds Register enjoys in its great sphere of usefulness.

The latest evidence of the activity of Lloyds Register is the thorough revision which the Society's Rules have undergone within the last few months in order to make them more conveniently applicable to the recent rapid developments of naval architecture. The rules as they now stand have been received by shipbuilders, naval architects, and shipowners in the United Kingdom, on the continent of Europe, and in the United States of America with a chorus of approval. In fact the success with which Lloyds Register has carried out this great work is understood to have proved a stimulus to the smaller and internationally less recognized Classification Registers to undertake, in emulation of the premier Society, a similar task with the results of the experience of Lloyds Register before them.

The Society of Lloyds Register has not, however, confined its classification to sea-going vessels, and in consequence its staff has gained experience in dealing with vessels intended for lake, river and harbor service.

Several vessels built in the United Kingdom to trade on the Great Lakes have been built to the Society's classification and have proved most successful. A great step forward was taken when Charles Buchanan, one of the chief experts from London, accompanied by J. H. Mancor, the Society's principal surveyor in this country, was sent out to make a special investigation into the conditions of Lake navigation and the methods of construction in vogue at lake ports, with a view to the elaboration of special rules directly applicable to the circumstances of the case. This action has been followed up by the despatch of James French, one of the ablest and most experienced surveyors on the staff of Lloyds Register in the Clyde district, who has established himself at No. 1517 Rockefeller Building, Cleveland, O., so as to place his services at the disposal of lake builders and lake owners.

One point of interest connected with Mr. French's later career is that he has been closely associated with the building of several vessels on the longitudinal system of construction, commonly known by the name of Mr. Isherwood, to whom belongs the credit of introducing this method of construction into present-day vessels.

It has been maintained that this system of construction will be found to be of special advantage in connection with vessels engaged in lake service, and both shipowners and shipbuilders will doubtless welcome the arrival of a man so well qualified as Mr. French with experience of both the o'der and newer methods of ship construction.

APRIL LAKE LEVELS.

The United States Lake Survey reports the stages of the Great Lakes for the month of April, 1910, as follows:

Lake Superior, 601.60 ft. above tide-water, New York.

Lakes Michigan-Huron, 580.27 ft. above tide-water, New York.

Lake Erie, 572.04 ft. above tide-water, New York.

Lake Ontario, 245.97 ft. above tide-water, New York.

Lake Superior is 0.06 ft. higher than last month, 0.31 ft. higher than a year ago, 0.39 ft. below the average stage of April of the last ten years, 0.65 ft. below the high stage of April, 1905, and 0.58 ft. above the low stage of April, 1892. It will probably rise 0.3 ft. in May.

Lakes Michigan-Huron are 0.27 ft. higher than last month, 0.02 ft. higher than a year ago, 0.26 ft. below the average stage of April of the last ten years, 2.96 ft. below the high stage of April, 1886, and 1.05 ft. above the low stage of April, 1896. They will probably rise 0.3 ft. in May.

Lake Erie is 0.36 ft. higher than last month, 0.04 ft. lower than a year ago, 0.28 ft. below the average stage of April of the last ten years, 1.83 ft. below the high stage of April, 1887, and 0.78 ft. above the low stage of April, 1895. It will probably rise 0.3 ft. in May.

Lake Ontario is 0.22 ft. higher than last month, 0.21 ft. lower than a year ago, 0.40 ft. lower than the average stage of April of the last ten years, 2.46 ft. below the high stage of April, 1886, and 1.10 ft. above the low stage of April, 1895. It will probably rise 0.3 ft. in May.

NEW CANADIAN STEAMSHIP CO.

The Merchant Mutual Line, Ltd., has been incorporated in Canada with a capital of $750,000, and offices at Toronto, to engage in general transportation on the lakes. Mackenzie, Mann & Co. are the controlling interests. The new company has taken over the steamships Plummer, Pellatt and Ames from the Canadian Lake & Ocean Navigation Co., and has bought the Beaverton and Mapleton from the Merchants Steamship Co., and the Saskatchewan from the Colonial Transportation Co. The Saskatoon is being built in Scotland, the order for her having been placed by J. W. Norcross and R. M. Wolvin. All these six vessels will be run in the Merchants Mutual Line, which must not be confounded with the Merchants Mutual Line, Ltd., the former being simply a line and the latter an owning company. The steamships Acadian and Canadian, owned by the Merchants Mutual Steamship Co., will also continue in the Merchants Mutual Line.

The steamships Turret Court, Turret Cape, Turret Chief and Scottish Hero remain under the Canadian Lake & Ocean Navigation Co.'s ownership.

J. W. Norcross, Toronto, has been appointed general manager Merchants Mutual Line, Ltd., and he will probably also manage the Canadian Lake & Ocean Navigation Co., which is also controlled by Mackenzie, Mann & Co. interests. J. W. Norcross & Co. are the general western agents of the Merchants Mutual Line.

Commerce of Lake Superior

IT HAS frequently been stated in the columns of THE MARINE REVIEW that there is no adequate measure of the port to port commerce of the great lakes, and, therefore, no way of determining the total commerce of the great chain of waters. However, it is fair to assume that more than half of the commerce of the lakes passes through the canals at Sault Ste. Marie, and it is fortunate indeed that records at this point are very reliably kept by the officials in charge of the United States and Canadian canals. Supt. Louis C. Sabin has just submitted to Col. C. McD. Townsend for transmission to the secretary of war the exhaustive report of canal commerce for 1909 that is known as the mile-ton report. The report shows that $36,291,948 was paid as carrying charges to vessels that moved 57,895,149 tons of freight through the canals in 1909, and that the total value of the freight was $626,104,173. The cost per ton per mile of moving this freight was 0.78 of a mill, as against 0.69 of a mill in 1908, 0.80 of a mill in 1907, 0.84 of a mill in 1906, 0.85 of a mill in 1905, 0.81 of a mill in 1904, 0.92 of a mill in 1903, and 0.89 of a mill in 1902.

The total freight traffic of 57,895,149 net tons for the season of 1909, when compared with the season of 1908, shows an increase of 40 per cent or 16,504,592 tons. All the items of freight show an increase when compared with the season of 1908. The total number of passengers was 59,948, an increase of 6,661. Vessel passages through both canals numbered 19,204, showing a gain of 4,023 or 26 per cent. The total lockages numbered 13,571, a gain of 2,886 or 27 per cent. The season of navigation continued for a period of 7 months and 27 days, during which time the average monthly freight traffic was 7,328,500 net tons.

The traffic through the American canal was 52 per cent of the total freight, and 46 per cent of the total number of passengers carried, the amounts being 30,132,374 tons of freight and 27,736 passengers. Compared with the season of 1908, there was an increase of 1,475,077 tons of freight or 5 per cent, and 4,657 passengers or 20 per cent. The American canal opened April 20 and closed Dec. 11, 1909, making the length of its season 236 days.

The traffic through the Canadian canal was 48 per cent of the total freight and 54 per cent of the passengers carried, the amounts being 27,762,775 tons of freight and 32,212 passengers. Compared with the season of 1908, there was an increase of 15,029,515 tons of freight or 118 per cent, and 2,004 passengers or 7 per cent. The Canadian canal was opened April 21 and closed Dec. 16, 1909, making the length of its season 240 days.

Total freight carried, tons	57,895,149
Total tons net register	46,751,717
Total mile-tons	46,812,929,345
Total valuation placed on freight carried	$626,104,173
Total amount paid for freight carried	$36,291,948
Total number of registered vessels using canals	870
Total number of passages by unregistered crafts carrying freight	242
Total valuation placed on registered vessels	$126,899,000
Total number of passengers transported	59,948
Average distance freight was carried, miles	809
Average cost per ton for freight transportation	$0.63
Average cost per mile per ton, mills	.78
Average value per ton of freight carried	$10.81
Time American canal was operated, days	236
Time Canadian canal was operated, days	240
Freight carried by—	
Registered vessels, tons	57,871,097
Unregistered vessels, tons	24,052
American vessels, per cent	94
Canadian vessels, per cent	6
Passengers carried by—	
American vessels, per cent	39
Canadian vessels, per cent	61
Average number of vessels passing per day—	
Through Poe lock	35
Weitzel lock	22
Canadian lock	27
Poe, Weitzel and Canadian locks	80

The number of registered vessels of 600 ft. and over in length, using the canal in trade to and from Lake Superior, was 5; of 500 to 600 ft. in length, 106; of 400 to 500 ft. in length, 157; of 300 to 400 ft. in length, 161; of 200 to 300 ft. in length, 224; of 100 to 200 ft. in length, 121; of less than 100 ft. in length, 8. The maximum freight traffic for a single day was on Aug. 26, 1907, when 487,649 tons passed through the canals on 121 vessels, having an aggregate registered tonnage of 287,385. Twenty-five new vessels were put in commission for the Lake Superior trade in 1909. They were all steamships for freight traffic. Ten of these new vessels are 500 ft. or more in length and carry from 10,000 to 13,200 net tons of freight in a single cargo on a draught of 20 ft. 1 in. The largest single cargo carried through the canals in 1909 consisted of 13,064 tons on the steamer E. Y. Townsend. The greatest amount of freight carried was 312,196 tons by the steamer E. Y. Townsend. The greatest number of miles run were 44,443 by the steamer E. Y. Townsend, while the greatest number of mile-tons was 280,610,200 by the steamer E. Y. Townsend. The following table will prove interesting as showing the distribution to other lakes of freight bound eastward from Lake Superior and also the district from which freight bound to Lake Superior originated:

EAST BOUND.

From Lake Superior ports to—	
Lake Michigan ports	6,812,298
Lake Huron ports	1,682,300
Lake Erie ports	37,142,094
Lake Ontario ports	742,394
Total	46,379,086

WEST BOUND.

To Lake Superior from—	
Lake Michigan ports	204,900
Lake Huron ports	342,316
Lake Erie ports	10,665,898
Lake Ontario ports	302,949
Total	11,516,063

In connection with the foregoing table, there is also the following summary of relative values of the different commodities passing through the canals:

	Per cent.
Coal (anthracite and bituminous)	4.64
Cereals (wheat, rye, oats, corn, barley, flax and flour)	31.60
Iron ore	23.33
Iron (manufactured and pig iron)	5.89
Copper (refined and concentrates)	5.20
Lumber	1.94
All other products	27.40
	100.00

The American canal records show that vessels necessarily spent 22,585 hours and 34 minutes in canal, or an average of 2 hours 2 minutes, which includes time waiting for lockage and passage through locks and canal, the latter being 1 3-5 miles long. Other delays at canal, which included taking on supplies, waiting for daylight or favorable weather, amounted to 10,531 hours and 52 minutes. Delays to vessels due to operating railway swing bridge amounted to 1 hour and 30 minutes. Trains were de-

ESTIMATED VALUE OF TOTAL FREIGHT PASSING THE CANALS AT SAULT STE. MARIE, MICHIGAN, AND ONTARIO, FOR THE SEASON OF 1909.

ITEMS.		Quantity.	Price per Unit.	Valuation.
Coal, anthracite	Net tons	1,412,387	$ 5.47	$ 7,725,757
Coal, bituminous	Net tons	8,527,639	2.50	21,319,098
Flour	Barrels	7,094,175	5.40	38,308,545
Wheat	Bushels	113,253,561	1.06	120,048,775
Grain, other than wheat	Bushels	46,519,451	.85	39,541,533
Iron ore	Net tons	40,014,978	3.65	146,054,670
Manufactured iron	Net tons	481,627	75.00	36,122,025
Pig iron	Net tons	40,654	17.40	707,380
Copper (refined and concentrates)	Net tons	127,212	256.00	32,566,272
Lumber	M. ft. B. M.	552,380	22.00	12,152,360
Salt	Barrels	651,091	.75	488,318
Silver ore	Net tons	.....	.....	.....
Building stone	Net tons	1,784	10.00	17,840
General merchandise	Net tons	1,140,344	150.00	171,051,600
Totals		.....	.....	$626,104,173

layed 18 hours and 56 minutes by passing boats temporarily preventing the closing of bridge. The aggregate time the railway swing bridge was swung across the canal amounted to 909 hours and 8 minutes, during which time 3,256 engines, 4.751 passenger cars and 26,143 freight cars crossed the bridge.

COMPARATIVE STATEMENT OF COMMERCE THROUGH THE CANALS AT SAULT STE. MARIE, MICHIGAN, AND ONTARIO, FOR THE SEASONS OF 1908 AND 1909.

ITEMS.		Traffic for 1909 United States Canal.	Traffic for 1909 Canadian Canal.	Total traffic for Season 1909.	Total traffic for Season 1908.
Vessel Passages—					
Steamers	Number.....	10,356	6,107	16,463	12,553
Sailing	Number.....	1,668	119	1,787	1,355
Unregistered	Number.....	779	175	954	1,273
Total	Number.....	12,803	6,401	19,204	15,181
Lockages	Number.....	8,607	4,964	13,571	10,685
Tonnage—					
Registered	Net.....	28,939,463	17,812,254	46,751,717	31,091,730
Freight	Net.....	30,132,374	27,762,775	57,895,149	41,390,557
Passengers	Number.....	27,736	32,212	59,948	53,287
Coal—					
Hard	Net tons....	1,060,753	351,634	1,412,387	1,384,743
Soft	Net tons....	6,150,540	2,377,099	8,527,639	8,517,717
Flour	Barrels.....	4,580,833	2,513,342	7,094,175	5,704,375
Wheat	Bushels.....	38,438,716	74,814,845	113,253,561	106,041,873
Grain, other than wheat	Bushels.....	17,990,396	28,529,055	46,519,451	43,458,583
Manufactured and pig iron	Net tons....	363,459	158,822	522,281	289,308
Salt	Barrels.....	449,977	201,114	651,091	547,223
Copper	Net tons....	118,889	8,323	127,212	101,735
Iron ore	Net tons....	18,866,499	21,148,479	40,014,978	24,650,340
Lumber	M. ft. B. M.	517,694	34,686	552,380	453,761
Silver ore	Net tons....	.....	.....	.....	.....
Building stone	Net tons....	1,784	.....	1,784	1,019
General merchandise	Net tons....	595,564	544,780	1,140,344	842,901

TABLE SHOWING TOTAL FREIGHT, ITS VALUATION, FREIGHT CHARGES, AVERAGE HAUL OR DISTANCE FREIGHT WAS CARRIED, AND RATE PER TON PER MILE.

Year.	Total Freight, Net Tons.	Valuation of Freight.	Freight Charges.	Average Haul.	Freight Charges, per Mile-Ton.	Value of American Craft.	Value of Canadian Craft.
1887	5,494,649	$ 79,031,757	$10,075,153	811.4	2.3	$ 17,684,550	$ 2,089,400
1888	6,411,423	82,156,019	7,883,077	806.4	1.5	20,381,100	1,514,300
1889	7,516,022	83,732,527	8,634,246	790.4	1.5	25,328,600	1,597,600
1890	9,041,213	102,214,948	9,472,214	797.2	1.3	27,857,700	1,777,800
1891	8,888,759	128,178,208	9,849,022	820.4	1.35	31,947,300	2,119,500
1892	11,214,333	135,117,267	12,072,850	822.4	1.31	36,220,100	2,108,700
1893	10,796,572	145,436,957	9,957,483	831.9	1.1	39,017,400	2,115,700
1894	13,195,860	143,114,502	10,798,310	821.1	0.99	41,124,200	1,959,800
1895	15,062,580	159,575,129	14,238,758	830.0	1.14	40,858,800	2,037,000
1896	16,239,061	195,146,842	13,511,615	836.4	0.99	43,006,200	2,135,300
1897	18,982,755	218,235,927	13,220,099	841.3	0.83	42,375,700	2,001,400
1898	21,234,664	233,069,740	14,125,896	842.6	0.79	45,199,800	2,491,900
1899	25,255,810	281,364,750	21,959,707	827.2	1.05	65,000,520	3,369,600
1900	25,643,073	267,041,959	24,953,314	825.9	1.18	66,116,583	3,618,576
1901	28,403,065	289,906,865	23,217,974	823.3	0.99	57,244,200	3,311,900
1902	35,961,146	358,306,300	26,566,189	827.4	0.89	67,205,000	3,792,400
1903	34,674,437	349,405,014	26,727,735	835.6	0.92	68,252,800	6,384,500
1904	31,546,106	334,502,686	21,552,894	843.5	0.81	63,789,300	5,377,100
1905	44,270,680	416,965,484	31,420,585	833.3	0.85	73,211,300	5,429,000
1906	51,751,080	537,463,454	36,666,889	842.4	0.84	88,392,000	6,140,500
1907	58,217,214	569,830,188	38,457,345	828.3	0.80	102,525,500	7,918,000
1908	41,390,557	470,141,318	23,903,244	842.0	0.69	101,643,000	10,054,000
1909	57,895,149	626,104,173	36,291,948	809.0	0.78	116,192,000	10,707,000

TRANSPORTATION CHARGES, INCLUDING LOADING AND UNLOADING, ON FREIGHT PASSING THROUGH CANALS AT SAULT STE. MARIE, MICHIGAN, AND ONTARIO, FOR THE SEASON OF 1909.

ARTICLES.		Quantity.	Rate per Unit.	Amount.
Coal	Net tons.....	9,940,026	$0.31	$3,081,408.06
Flour	Barrels.....	7,094,175	.23	1,631,660.25
Wheat	Bushels.....	113,253,561	.02	2,265,071.22
Grain, other than wheat	Bushels.....	46,519,451	.02	930,389.02
Manufactured iron	Net tons.....	481,627	1.80	866,928.60
Pig iron	Net tons.....	40,654	1.50	60,981.00
Salt	Barrels.....	651,091	.15	97,663.65
Copper	Net tons.....	127,212	1.10	139,933.20
Iron ore	Net tons.....	40,014,978	.59	23,608,837.02
Lumber	M. ft. B. M.....	552,380	2.40	1,325,712.00
Silver ore	Net tons.....	.....	.....	.....
Building stone	Net tons.....	1,784	1.50	2,676.00
General merchandise	Net tons.....	1,140,344	2.00	2,280,688.00
Total		.....	.....	$36,291,948.02

Appended to this report is a calculation of the commerce passing through the Detroit river. While there is no means of obtaining the actual statistics of freight actually carried through the Detroit river, the government engineers have succeeded in approximating it by calculating the proportion of freight tonnage to registered tonnage. Both the registered and freight tonnage of the Sault Ste. Marie canals are known, and as the vessels which traverse the Detroit river are the same ones that pass through St. Mary's Falls canal, it is comparatively simple to approximate freight tonnage of the Detroit river. The report of the Detroit river traffic is as follows:

The number and class of vessels and the number of vessel passages have been taken from the custom house records at Detroit, Windsor and Amherstburg; and from the marine post office records at Detroit. The registered tonnage is taken from the American and Canadian "blue books." The postmaster at Detroit has permitted the records of vessels passing Detroit to be copied from the marine post office books. The records of those stopping at Detroit were obtained from the Collectors of Customs at Detroit, Windsor and Amherstburg. The vessel passages and registered tonnage by months are as follows:

Month.	Number of Vessels.	Registered Tonnage.
January	29	6,506
February	37	6,202
March	136	27,815
April	1,215	955,309
May	3,265	4,671,345
June	4,164	6,728,197
July	4,994	8,072,237
August	4,774	8,361,654
September	4,599	8,319,031
October	4,340	8,477,227
November	3,666	7,223,764
December	1,077	1,819,559
Total	32,296	54,668,846

The number of vessels using Detroit river during 1909 was as follows:

Number of American vessels	1,140
Number of Canadian vessels	172
Number of steam vessels	958
Number of sail vessels	354
Total number of vessels	1,312

It is found from the custom house records that 3,946,964 net registered tons that used the Detroit river did not go through the St. Clair Flats canal, but either stopped at Detroit or turned around and went back down the river. The commerce of the canal is, therefore, less than that of the river by this amount; making this subtraction, the net registered tons passing St. Clair Flats canal is found to be 50,721,882 tons.

In addition to the preceding results, there are a number of quantities that from the nature of the data can be very closely estimated. For example, the actual freight, in tons, that is carried through the Detroit river can be closely estimated by comparison with the tonnage of St. Mary's Falls canal, where records of both net registered and actual freight are kept. During the season of 1909 the actual freight passing St. Mary's Flats canal was 24 per cent greater than the net registered tonnage. Since about three-fourths of the Detroit river tonnage is St. Mary's Falls canal tonnage, there is no error in assuming that the ratio for these three-fourths is the same for Detroit river as for St. Mary's Falls canal. The remaining fourth is mostly traffic to and from Lake Michigan ports. An inspection shows that there is approximately the same proportional number of loaded and light ves-

sels on this route as on the Lake Superior route. There can be no large error in assuming that the ratio between registered and freight tonnage for this one-fourth is also the same as that for St. Mary's Falls canal. Therefore, increasing the registered tonnage by 24 per cent, the estimated actual freight of Detroit river is 67,789,369 tons of 2,000 lbs. each.

The value of the freight passing St. Mary's Falls canal during the season of 1909 was found to be $10.81 per ton. Assuming this unit value for the Detroit river commerce, the total estimated value of the actual freight passing Detroit river during the season of 1909 would be $732,803,079.

In addition, there are two registered passenger ferries, and five registered railroad ferries that have not been included in the preceding tables, also there is a large number of unregistered power boats using the river. No complete record of these boats is kept; the exact number is not known. The inspector of hulls reports that they have issued Pilot Rules to 850 motor boats. The collector of customs estimates the number at "a thousand and upwards."

The commerce passing the Detroit river has now been determined with great accuracy for eight consecutive years and is as follows:

Year.	Number of Passages.	Net Registered Tons.	Freight Tons, Estimated.	Value, Estimated.
1902	33,000	39,328,689	44,260,506	$440,834,640
1903	33,113	37,453,796	46,817,245	471,917,830
1904	29,472	33,049,964	42,792,326	453,598,656
1905	35,599	45,912,622	55,508,360	522,888,751
1906	35,128	50,673,897	63,808,571	662,971,053
1907	34,149	53,959,769	71,226,895	697,311,302
1908	27,883	40,628,850	54,086,750	614,425,480
1909	32,296	54,668,846	67,789,369	732,803,079

The number of vessel passages has increased 4,413 over last year. The net registered tonnage has increased 14,039,996 tons. There were 826 steam vessels having a tonnage greater than 100 tons. Their average tonnage was 2,177 net registered tons, an increase of 121 tons over last year.

There were 321 sail vessels having a tonnage greater than 100 tons. Their average tonnage was 681 tons, a decrease of 120 tons. The average registered tonnage of all vessels using Detroit river during the season of 1909 was 1,693 tons—an increase of 236 tons over last year.

GENERAL SUMMARY.

Net registered tons, Detroit river	54,668,846 tons
Net registered tons, St. Clair Flats canal	50,721,882 tons
Total number of vessels	1,312
American vessels	1,140
Canadian vessels	172
Steam vessels	958
Sail vessels	354
Total number of vessel passages	32,296
Average tonnage of all vessels	1,693 tons
Estimated actual freight	67,789,369 tons
Estimated value of freight	$732,803,079

"SUMMER TOURS."

"Summer Tours" is the name of the latest tourist book issued by the Cleveland & Buffalo Line. Among the finest specimens of the printing art issued nowadays are trade publications and Summer Tours occupies very high rank in this particular. It is abundantly illustrated in half-tone while the letter press is printed in a brown tone. Descriptions are given not only of various resorts contiguous to the company's service but of many which may easily be reached by collateral lines, for instance the great Muskoka region in Georgian bay and the limitless attractions of the Lake Superior country. It is surprising how much information of real value is to be found in publications of this character. W. F. Herman, general passenger agent, Cleveland, will send the book free to anyone upon receipt of six cents to cover postage.

THE DOCK BUILDING ENTERPRISE IN CANADA.

According to a dispatch from Ottawa, Sir Robert W. Perks, who is a member of the Ottawa contracting firm of McArthur, Perks & Co., Ltd., announces that, as the result of negotiations with the Canadian government, arrangements have been concluded for the construction of two immense dry docks capable of accommodating the largest warships or ocean steamers afloat. One of the dry docks is to be constructed at Levis, on the bank of the River St. Lawrence, opposite Quebec, and the other at St. John, New Brunswick. Sir Robert Perks also states that arrangements have been made to provide both docks with a complete equipment of shipbuilding plant, the financing of this latter project being undertaken by Messrs. Harland & Wolff, of Belfast, the Canadian Pacific Railway Co., and Messrs. McArthur, Perks & Co.

Incorporation has been granted to the Dominion Dry Dock Shipbuilding Co., which is to make this provision, and those who have formed the Corporation are: Lord Pirric (Messrs. Harland & Wolff, Belfast), Sir Thomas Shaughnessy (president of the Canadian Pacific railroad), Sir Robert Perks, Hugh Allan and W. Dobell.

The Dominion government is reported to be favorable to increasing the government subsidies towards the construction of the dry docks from 3 to 3½ per cent for 35 years on the cost of construction as under: First class dry docks, capable of receiving the largest ships in the British navy, will be subsidized on a maximum cost of $4,000,000 and receive annually $140,000; second class docks, on a maximum of $1,500,000, will carry a yearly subsidy of $87,500; and those of the third class, costing $500,000, will only have a grant of 3 per cent for 20 years, and receive each year $15,000.

NEW MONSTER ORE CARRIERS NOW BUILDING.

There are at the present time under construction in British yards six large ore-carrying steamers on Norwegian account for the Canadian ore trade. W. Wilhelmsen, of Tousberg, Norway, has two building at Sunderland, one of 10,000 tons and the other of 12,000 tons, both of which are intended for the Canadian ore trade. Messrs. W. Doxford & Sons, Sunderland, are building two huge ore-carriers also for Norwegian account and also presumably for the same trade. On the Tyne, there are also building two 10,000-ton ore steamers for Pet. Gron, of Laudefford (Norway), but it is supposed these are intended for the Lulea and Norvik ore trades. The Norwegian shipowners have shown remarkable enterprise in getting into the Canadian iron ore trade. In the last three or four years, quite a number of large specially designed vessels have been built on the East Coast of Britain, for this trade, and nearly all of them for Norwegian owners. The orders before mentioned show that the Norwegians are still pressing into the trade on which they already have such a strong hold.

RIVALING THE CUNARDERS.

It is known that the Hamburg-American Co. has lately been in the market for two new steamers for its Atlantic service, and that the vessels are to be of mammoth proportions. According to advices from Berlin, the Hamburg-American Co. is about to place an order with the Hamburg branch of the Vulcan Works at Stettin for a new passenger and cargo steamer, 800 ft. long, with a displacement of 45,000 to 50,000 tons, and a speed of 20 knots. A dock of some 820 ft. long will be built for the accommodation of the vessel. It is believed that if a second steamer is ordered, the well known firm of Messrs. Harland & Wolff, Belfast, will be the builders.

The vessels, while designed to exceed the present express Cunarders in size, are evidently not intended to compete with them in speed. The fact that the engines are to be of the reciprocating type is also interesting to the advocates of its rival, the turbine, as well as to those who believe in the future of the combination principle.

Accidents to Lake Vessels

THE accident list for 1910 shows that the majority of accidents have occurred through bucking ice preceding the regular opening of navigation. Fire, however, has taken its toll, the heaviest damages being attributed to this cause. Seven fires have occurred so far this year. It is singular, but fire is one of the most frequent and most disastrous causes of accidents to lake ships. Collisions have been few, though strandings have been frequent. Following is the detailed summary:

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	PLACE.
Jan. 2	Str. Thos. Shaughnessy.....	Fire, which had been smoldering in hold for some time, broke out seriously	Buffalo.
Jan. 8	Str. Arizona.....	Cylinder head of engine blew out.....	Lake Michigan, off Chicago.
Jan. 22	Tug A. W. Colton.....	Lost her rudder going through ice.....	Toledo Harbor.
Jan. 24	Str. Promise.....	Lost wheel in heavy ice.....	Toledo.
Jan. 31	Tug A. C. Harding.....	Lost shoe in heavy ice; docked.....	Duluth Harbor.
Jan. 31	Tug James Sinclair.....	Lost wheel stern bearing and outboard shaft while breaking ice...	Superior.
Jan. 31	Tug Harvard.....	Lost rudder while crushing ice.....	
Jan. 31	Tug A. W. Colton.....	Lost rudder while crushing ice.....	
Feb. 8	Tug Alva B.....	Hole in her bow through bucking ice; docked for repairs.....	Cleveland Harbor.
Feb. 24	Str. Naomic.....	Struck by carferry Grand Haven while lying at dock, portion of port side crushed in aft of amidships as well as plates in between decks	Grand Haven, Mich.
Feb. 26	Str. Wisconsin.....	Damaged by fire while tied at dock; loss, $5,000.....	Chicago.
Mar. 3	Str. Hennepin.....	Crashed into Huron street bridge, demolishing bridge-tender's house	Milwaukee.
Mar. 8	Carferry Ann Arbor No. 1....	Burned to water's edge with 20 loaded cars of lumber, as result of an explosion; valued at $60,000; wreck lies in 16 ft. of water	Manitowoc, Wis.
	Tug Pallister.....	Cut by ice and sank at her moorings; raised March 14 and taken to Amherstburg	Bois Blanc Island.
Mar. 19	Str. Wisconsin.....	Damaged by fire; cabins destroyed.....	Chicago.
Mar. 22	Str. Alberta.....	Damaged by fire.....	Owen Sound.
Mar. 25	Str. Crete.....	Struck by barge Constitution, which was torn from her moorings by ice; slightly damaged.....	Ashland.
Apr. 4	Schr. Augustus.....	Ran into sunken crib and sank in 10 ft. of water.....	Sturgeon Bay.
Apr. 8	Str. Wolverine.....	Burned to water's edge; surrounding property also damaged; loss estimated at $100,000.....	Selkirk, Man.
Apr. 14	Str. John Rugee.....	Damaged by fire; loss estimated at $10,000.....	Ogdensburg, N. Y.
Apr. 17	Str. Hoover & Mason.....	Boiler exploded; three men severely scalded; repairs made with help of str. Chili, which went to her assistance.....	Off Outer Island, Lake Superior.
Apr. 17	Str. Bethlehem.....	Ran ashore in heavy fog; released on 19th, but beached again, owing to big leak; released on 21st; docked at Buffalo.....	Port Hope, Lake Huron.
Apr. 17	Str. Maryland.....	Collided with str. R. S. Warner in heavy fog; hole stove in her bow; put in at Harbor Beach; docked at Buffalo.....	Point Aux Barques, Lake Huron.
Apr. 17	Str. R. S. Warner.....	Collided with str. Maryland in heavy fog; bow twisted, hawse pipe broken and 12 plates damaged; lost an anchor; docked at Cleveland; left dry dock on 28th.....	Point Aux Barques, Lake Huron.
Apr. 17	Str. P. A. B. Widener.....	Grounded; Nos. 1, 2 and 8 tanks on both sides leaked; docked at Lorain; 18 damaged plates; out of commission two weeks....	Gull Island, Lake Michigan.
Apr. 21	Str. C. H. Bradley.....	Stove in a plank below water line while going through ice; leaked badly and stopped at Port Colborne for repairs.....	Lake Erie.
Apr. 23	Str. Iowa.....	Grounded; docked at Milwaukee; entire sheeting removed in order to recalk all seams; number of bottom planks broken.....	Lake Michigan, near Racine.
Apr. 23	Bge. Constitution.....	Lost quadrant in gale; towed to Marquette for repairs.....	Lake Superior.
Apr. 23	Str. Turret Cape.....	Ran ashore; bottom badly damaged; towed into Goderich harbor..	Lake Huron, near Goderich.
Apr. 24	Tug Zenith.....	Became disabled; towed to Chicago, where she made another start	Lake Michigan.
Apr. 24	Str. Geo. W. Peavey.....	Ran aground on rocky bottom; out 1 ft. forward; released on 27th	Seneca Shoal, Lake Erie.
Apr. 24	Str. Northern King.....	Wheelhouse and forward cabins crushed in by gale.....	Lake Superior.
Apr. 25	Str. Clyde.....	Broke all buckets off her wheel; repaired at Buffalo.....	Niagara River.
Apr. 27	Str. Glenmount.....	Steering gear broke; ran aground; released on 28th, after lightering	St. Clair Ship Canal.
Apr. 29	Str. Robert Mills.....	Eccentric rod broke; picked up by str. Clement and taken to Detroit for repairs.....	Off Presque Isle, Lake Huron.
May 1	Str. Saronic.....	Steering gear and rudder damaged.....	Lake Superior.
May 1	Str. Martin Mullen.....	Stranded, owing to parting of wheel chains; released, uninjured...	Stribling's Pt., St. Mary's River.
May 1	Bge. Harold.....	On entering canal, took a sheer and struck bank; one blade of rudder broken off.....	Canadian Sault.
May 2	Str. St. Paul.....	Dragged her anchors in gale and was driven on bank.....	Port Huron.
May 3	Bge. Halstead.....	Struck the south pier in gale; badly damaged; deck load of lumber, unshipped; went to bottom of Duluth harbor; lumber cargo is being lightered.....	Duluth Ship Canal.
	Str. Mary A. McGregor.....	Ran ashore; lost foreboat and foreboat iron; port side of keel damaged for about two-thirds length of vessel; docked at Cleveland	Georgian Bay.
	Str. D. Leuty.....	Broke crank pin and returned to Port Huron for repairs; delayed three days	Off Port Sanilac, Lake Huron.
May 4	Bge. Tyrone.....	Driven onto str. Schuck by gale; hole punched in her port bow just below water line; No. 1 tank and fore peak full of water; repaired at the Sault.....	Sault Ste. Marie, Mich.
May 6	Str. Sequin.....	Struck muddy bank in channel; released on 8th, after lightering; reloaded cargo on 10th.....	Detroit River.
May 8	Str. C. A. Eddy.....	Ran ashore; out 5 ft. forward; lightered; leaked and was in pretty bad shape.....	Gravelly Island, Green Bay.

The Marquette & Bessemer Dock & Navigation Co. has given contract to the American Ship Building Co. for a car ferry to replace the car ferry Marquette & Bessemer No. 2, which was lost on Lake Erie last December. The new car ferry will be somewhat larger than the old one, being 350 ft. long, 56 ft. beam and 19½ ft. deep, with capacity for 30 cars.

The Anchor Line steamer, Octorara, built at the yard of the Detroit Ship Building Co., underwent a successful trial trip on April 23. She will be commanded by Capt. Edward Martin.

The construction of the new ship yard which the American Ship Building Co. is building at Port Arthur, is proceeding satisfactorily, and it is expected that the plant will be in operation before the close of the current year.

The Pittsburg Steamship Co. has made a five-year contract with the Submarine Signal Co., of Boston, to equip all of its steamers with submarine signal apparatus. Thirteen of the larger steamers were equipped a year or more ago and results of the service have been very satisfactory. It has proved a wonderful aid to lake ships in finding their positions at the turning points in thick weather.

BATTLESHIP FLORIDA LAUNCHED.

The battleship Florida was launched from the New York navy yard, May 12. The leading particulars of the new vessel are as follows: Length, 521 ft. 6 in.; beam, 88 ft. 2½ in.; displacement, 21,825 tons; coal supply, 2,500 tons; oil, 400 tons; belt armor, 12 in. to 8 in.; turret armor, 12 in.; battery armor, 6½ in.; 12-in. guns, 10; contract speed, 20.75 knots.

LONGEST COAL TRAIN.

The new Virginia railway has the record of hauling the longest coal train in the history of American railroads. The train consisted of 120 50-ton steel coal cars, each 44 ft. long, and each loaded with 50 tons of coal. The train from cowcatcher to caboose was 6 ft. more than a mile long. It was hauled from Roanoke by a single engine of the Mallett compound type. It is interesting to observe that this single train load would have made a comfortable cargo for an average size coal carrier on the lakes.

PERSONAL.

The Cleveland office of Babcock & Penton, engineers and naval architects, has been removed from 814 Perry-Payne building to the Penton building, 1136 Chestnut avenue.

Benjamin K. Hough has been appointed Boston sales manager for the Wisconsin Engine Co., with offices in the Oliver building, Boston.

The Buffalo & Susquehanna Iron Co. has been merged in the Rogers-Brown Iron Co., which will hereafter conduct the business.

Col. William H. Bixby will succeed Gen. W. L. Marshall as chief of engineers, United States army, in June. Col. Bixby is well known on the lakes, having been stationed at Chicago for a number of years. Col. Bixby was born at Charlestown, N. Y., in 1849, and is now the senior engineer officer of his grade.

SHIP BUILDING DURING APRIL.

The bureau of navigation reports 92 sail and steam vessels of 129,125 gross tons were built in the United States and officially numbered during the month of April, 1910, as follows:

	WOOD. Sail.		WOOD. Steam.		STEEL. Steam.		Total.	
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	3	850	38	1,573	6	12,314	47	14,737
Pacific	1	37	18	955	..	.....	19	992
Great Lakes	..	...	12	318	3	12,839	15	13,157
Western rivers	..	...	11	239	..	.....	11	239
Total	4	887	79	3,085	9	25,153	92	29,125

ANOTHER WONDERFUL INVENTION.

Every now and then, shipbuilders receive most astounding letters regarding improving methods of propelling vessels, one inventor recently putting forward a scheme for driving steamers across the North Atlantic in a day! The following remarkable letter, however, which was addressed to Swan, Hunter & Wigham Richardson, Ltd., as the builders of the Mauretania, is a wonderful creation:

April 14, 1910.

Gentlemen:—I am sure that I have something that would be of great interest to you or other shipbuilders, the idea is to stop such as the Mouritania from being a floating colliery and a roaring Furness, that is to dispence with the boilers and bunker room and convert it into cargo or passenger roon and the space that her funnells take up. The machine is very simple, and any pressure can be applied in a minute or so and can be reduced as quickly, it consists of one casting and will weigh about three tons when completed with four valves and mecanicle parts, and would not cost more than £150. If this is anything in your line I shall be pleased to hear from you.

Yours faithfully,

EFFECT OF WIRELESS INDUCTION UPON LAMPS.

A recent complication in the electric lighting of ships was introduced with the wireless telegraph. It was observed that the high induction of the wireless had a serious effect upon the lamp renewal expense of the Graham & Morton Transportation Co., and extensive tests were made by them to find the lamp which would best stand up under this high induction. Twelve different makes of lamps were tested, among them the Sterling special, a spiral filament type, made by the Sterling Electrical Mfg. Co., of Warren, O. Three lamps of each make were tested, each being subjected to the high induction for one hour. Eleven of the twelve types of lamps tested failed to withstand this severe test. The filament of each type would spread, hit the glass and blow out. At the end of the test all three of the Sterling Special lamps were burning and were in perfect condition.

TRADE NOTES.

The Webster-Citizens Co., Buffalo, N. Y., is building a 60-ton ice-making plant on Essex street, near Richmond, and has placed an order for the necessary machinery with the Great Lakes Engineering Works, Detroit, Mich. The Bishop Cell-Block system of freezing will be used, the ammonia compressors and all auxiliaries to be driven by electric motors, taking current generated at Niagara Falls.

The Citizens Ice & Cold Storage Co., of Toledo, will build another ice plant in the residence portion of the city, and has contracted with the Great Lakes Engineering Works, Detroit, Mich., for machinery to manufacture 60 tons of Bishop Cell-Block ice per day. All the machinery will be driven by a 300-H. P. gas engine using natural gas.

SEALED BIDS WILL BE RECEIVED BY the Director of Public Service of the City of Lorain, State of Ohio, at the office of said Director until twelve o'clock, noon, May 26th, 1910, for furnishing the necessary labor and materials for the improvement of the water works system, according to plans and specifications on file in said office, as follows: By furnishing and laying a new 48-inch cast iron or 51-inch steel intake pipe from the present filter house to a point about 2,800 feet in Lake Erie; furnishing and placing the necessary specials, valves and fittings; furnishing and placing a new intake crib, together with the necessary excavating, filling, etc. Each bid must contain the full name of every person or company interested in the same, and be accompanied by a bond in the sum of 10 per cent of the amount of the bid to the satisfaction of the Director or a certified check on some solvent bank of the City of Lorain, Ohio, as a guarantee that if the bid is accepted, a contract will be entered into and its performance properly secured. Should any bid be rejected such check will be forthwith returned to the bidder, and should any bid be accepted such check will be returned upon the proper execution and securing of the contract. Bidders are required to use the printed forms which will be furnished upon application. Bids must be for either labor or material or both, and if for both, each bid must be stated separately with price. The Director of Public Service reserves the right to reject any or all bids. By order of the Director of Public Service. L. B. Johnston, clerk.

PROPOSALS—SALE OF U. S. S. HORNET.—Sealed proposals will be received at the Navy Department until noon on June 1, 1910, at which time and place they will be opened for the purchase of the U. S. S. Hornet, which may be examined at any time after the date hereof by applying to the Commandant, Navy Yard, Norfolk, Va. Appraised value, $7,000. Prospective bidders should apply to the Navy Department for forms of bids and bonds, together with the terms and conditions of sale; also printed list giving general information to bidders. The Department reserves the right to withdraw the vessel from sale and to reject any or all bids. Beekman Winthrop, Acting Secretary of the Navy.